APR 20 1923

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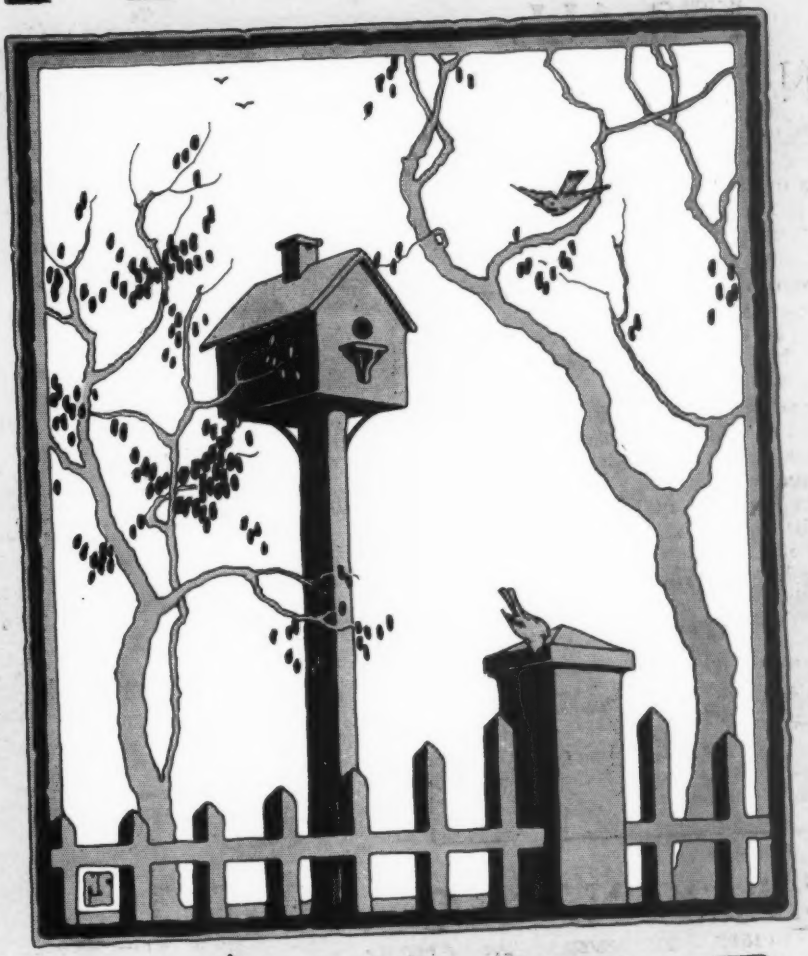
# The INDUSTRIAL-ARTS MAGAZINE



## APRIL 1923

The Bruce Publishing Company
Milwaukee Wisconsin

# ATKINS
## SILVER STEEL SAWS

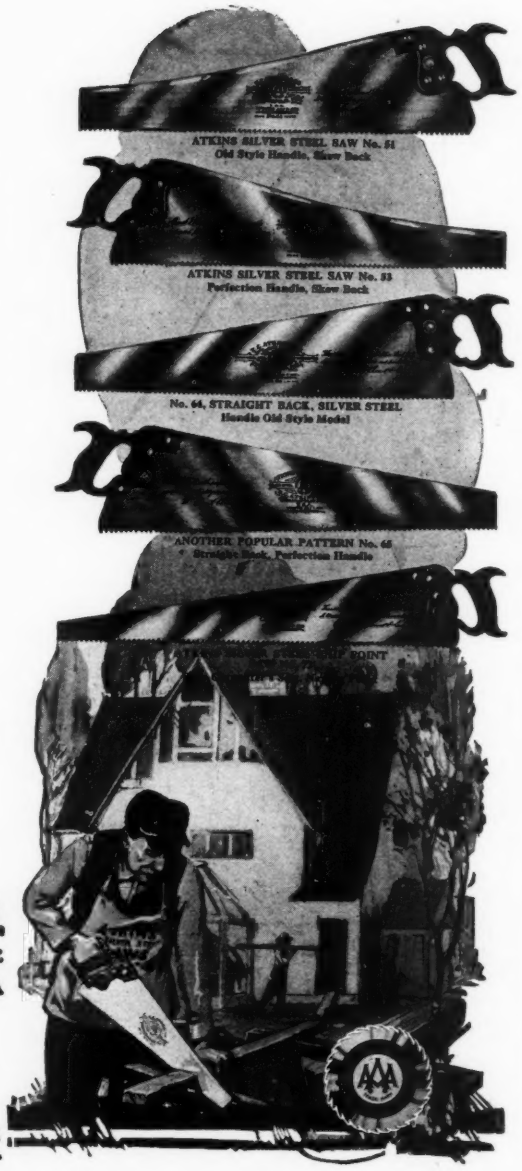
## IT'S ALL IN THE GRIND

Life is a huge grindstone. Some people are ground down—others are polished up—it all depends upon the kind of stuff that's in them. A saw is a lot like a man—what it is when it comes from the grindstone depends upon the kind of stuff it's made of.

No amount of grinding or polishing will make up for "poor stuff." And on the other hand, as we said in our last month's advertisement, much of the service of Atkins Silver Steel Saws comes from the grind.

You know a good hand saw is ground tapering from heel to point. But if that were the only thing that good workmen demanded, this would never have been written. It's the double taper of Atkins Saws that makes them fast, easy cutters. They are ground not only to taper from heel to point, but they are as carefully tapered from teeth to back. That two way taper is what makes them

*"The Finest on Earth."*


ATKINS SILVER STEEL SAW No. 51
Old Style Handle, Skew Back
ATKINS SILVER STEEL SAW No. 53
Perfection Handle, Skew Back
No. 64, STRAIGHT BACK, SILVER STEEL
Handle Old Style Model
ANOTHER POPULAR PATTERN No. 65
Straight Back, Perfection Handle

*Send for Educational literature, free—*
*"Saw Sense"*
*"Saw Fitting For Best Results"*
*"How To Care For And Use Cross Cut and Hand Saws"*

## E.C. ATKINS & CO.

**ESTABLISHED 1857 THE SILVER STEEL SAW PEOPLE**

**Home Office and Factory, INDIANAPOLIS, INDIANA**

**Canadian Factory, Hamilton Ontario**

**Machine Knife Factory, Lancaster N.Y.**

***Branches Carrying Complete Stocks In The Following Cities:***

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| Atlanta | New Orleans | Seattle |
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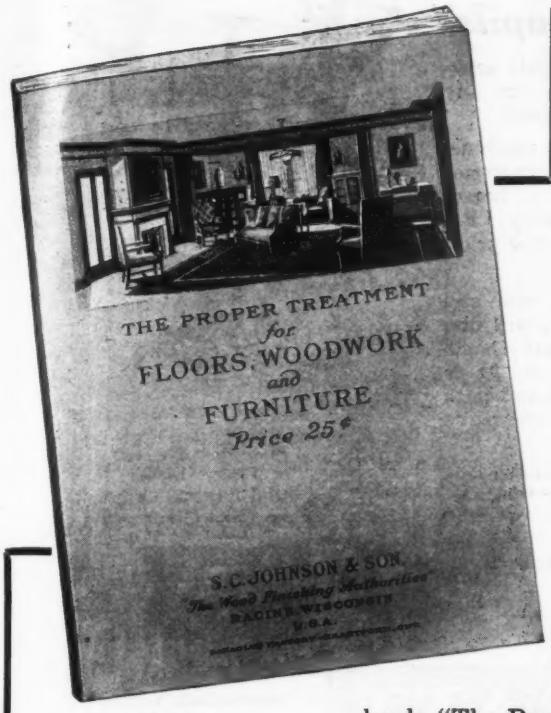


# Get Your Copy of This Book

It's the best book ever published on Artistic Wood Finishing and should be in the hands of every Wood Finishing Instructor. It is full of valuable information on finishing all wood—soft and hard. Considerable space is devoted exclusively to the finishing of manual training models. It's the work of experts—illustrated in color.

## HOW TO GET IT FREE

Write us (mentioning the name of the firm from whom you buy paints, varnishes, etc.), and we will gladly send you our book, "The Proper Treatment for Floors, Woodwork and Furniture" free and postpaid.

# JOHNSON'S ARTISTIC WOOD FINISHES

Johnson's Artistic Wood Finishes are particularly adapted for manual training work as they may be applied by the youngest and most inexperienced pupils with good results. Johnson's Artistic Wood Finishes are standard for manual training—they are being used all over the United States and Canada for this purpose.

**Our line of Artistic Wood Finishes is complete—it includes:—**

***Johnson's Prepared Wax***
***Johnson's Wood Dye***
***Johnson's Crack Filler***
***Johnson's Paste Wood Filler***
***Johnson's Perfectone Undercoat***
***Johnson's Perfectone Enamel***
***Johnson's Electric Solvo***
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You will find this entire line described in our book. Any time specific information is desired, or whenever you want specially finished wood panels, do not hesitate to write us. We solicit correspondence with Manual Training Instructors.

***Mail attached coupon for this authoritative book on Wood Finishing.***

**S. C. JOHNSON & SON, RACINE, WIS.**
*"THE WOOD FINISHING AUTHORITIES"*
(Canadian Factory—Brantford)

## S. C. JOHNSON & SON,

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Please send me free and postpaid your authoritative book on Artistic Wood Finishes for use in manual training work.

The best dealer in paints here is.....

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## *"Just the machine for your pupils"*

"This Goodell-Pratt Bench Lathe is a mighty serviceable and practical piece of machinery for any trade or technical school," declares Mr. Punch.

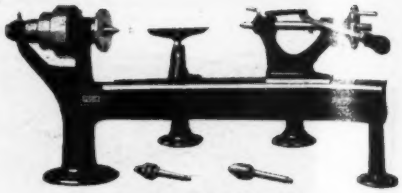
A bench lathe like this is an all-round machine. It does both elementary manual training exercises and advanced work. It requires less than ¼ horsepower and does a job quickly and accurately. Besides, this lathe is sold at a surprisingly low price, within the means of any school.

Because you buy tools to stand the wear and tear of rough and continuous usage, you will find it worth while to get this Goodell-Pratt Bench Lathe. Mechanics, artisans, carpenters, and home putterers have learned to place confidence and faith in this machine and every tool that bears the name of Goodell-Pratt.

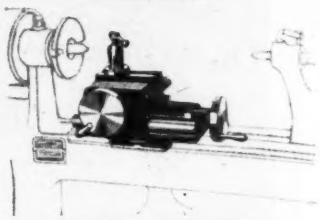
Write for further information concerning this bench lathe and for our free illustrated catalog No. 14 showing hundreds of different tools, many of which are just what technical and vocational training schools need.

GOODELL-PRATT COMPANY, Greenfield, Mass., U. S. A.

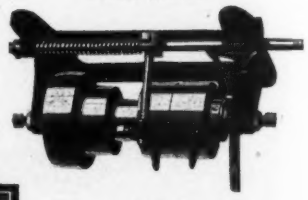
*Toolsmiths*



Bench Lathe No. 494
Price, $40.00



Slide Rest No. 132
Price, $16.00



Countershaft No. 130
Price, $11.00

# GOODELL-PRATT
## 1500 GOOD TOOLS

## WILLIAMS' SUPERIOR
**Drop-Forged Wrenches**

THE American workman has conferred upon us the title of *"The Wrench People,"* because he can always get a Williams' Wrench that is exactly right for his purpose.

40 Standard Patterns in 1000 Sizes.

*Wrench Book on request.*

**J. H. WILLIAMS & CO.**
*"The Wrench People"*
BROOKLYN BUFFALO CHICAGO

## MAYDOLE HAMMERS
THE WORLD'S STANDARD

There are none better made—none better known. When you buy these hammers, you are certain of getting the best. They are used the world over.

Maydole Hammers are made of finest quality material, and guaranteed first-class in every respect.

Write for our booklet of useful information, which every student should have. How many shall we send?

**The David Maydole Hammer Company**
NORWICH NEW YORK U. S. A.

OLIVER

# The "Oliver" No. 585 Oilstone Grinder

has met with considerable favor in both industrial and school shops. It is motor driven, attaches to any lamp socket. It is available for use in such shops as are not supplied with electric power lines. Every Grade Manual Training Shop should have one. Every wood shop, furniture factory and industrial training school should have an oilstone grinder.

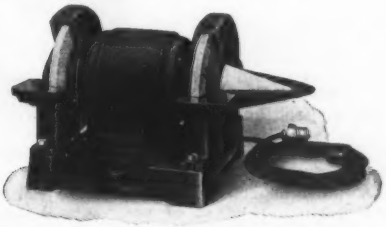
The Oilstone Grinder is the modern tool for sharpening edge tools, machine-knives, chisels, gouges, plane bits, etc.

"Oliver" No. 585 Variety Oilstone Tool Grinder.

"Oliver" No. 585 Variety Oilstone Tool Grinder.

**FEATURES**

1. Coarse Oilstone Grinding Wheel
2. Fine Oilstone Grinding Wheel
3. General Dry Grinding Wheel
4. Grinding Cone — for grinding gouges, etc.
5. Stropping Wheel.
6. Tool Holders with screw adjustment.
7. Direct Motor Drive.
8. Connects to any electric lamp socket.
9. Ball Bearing Machine.
10. Portable.



This No. 485 Motor Grinder complete with motor, one coarse emery wheel 8" x ¾", one fine wheel 8" x ½", one emery cone, guards, tool rests, cord switch and plug for light socket connection.

F. O. B. Grand Rapids, Mich.....$70

## Oliver Machinery Co.

**Grand Rapids, Mich., U. S. A.**

# PARKER VISES

**Have Seven Superior Features**

THESE Seven Features, the result of 81 years of progressive vise manufacturing experience, assure the user of Parker Vises unusually long and efficient service. Five are pictured below; all seven are shown in a Feature Folder which we should be glad to send you.

**Semi-Steel Castings**

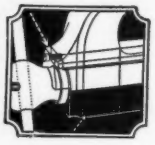
Cast in our own foundries; a special mixture of Bessemer steel and Grey Iron that stands the "gaff" as no other metal we know of.

**Steel-Ribbed Slides**

Note the flat strip just above the screw. A solid steel bar is cast into the slide, providing overstrength where the greatest strain comes.

**Solid Underportion**

instead of hollow as in most vises. Outside saddle and saddle screw permits taking up lost motion, and allows easy removal of screw for lubrication.

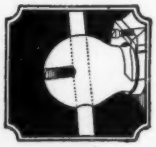


**A Swivel Base That *Grips Like a Grizzly***

Not a mere clamping device but a wedge and ring construction that gives a gripping power 360 degrees of the base.

**Handle "Stays Put"**

Set screw and spring prevent it sliding down and pinching fingers, yet allow the user to slide it readily back and forth for convenient positions.



***Send for Feature Folder and Catalog No. 57-A***

If you are especially interested in a vise for any particular phase of your school work, we shall be glad to suggest the Parker best fitted to your requirements.

**The Charles Parker Company**

***Master Vise Makers***

**Meriden, Conn., U. S. A.**

**PARKER VISES**
***"Grip Like a Grizzly"***

TRADE MARK

# "STAR"
## Hack Saws

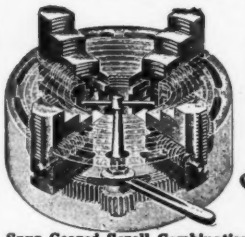
***Want the Best?***

**TRY IT**

**CLEMSON BROS., Inc.**
**MIDDLETOWN, N. Y.**
**Makers Since 1883**

**DURABILITY — ACCURACY — STRENGTH**
**are striking features of**

## Westcott Chucks



**Spur Geared Scroll Combination Lathe Chuck**

They are as essential in the schoolroom as in the commercial shop. The student who learns his trade using the very best of tools and equipment, is sure to benefit in the end.

**In the case of chucks—**
**BUY WESTCOTT**

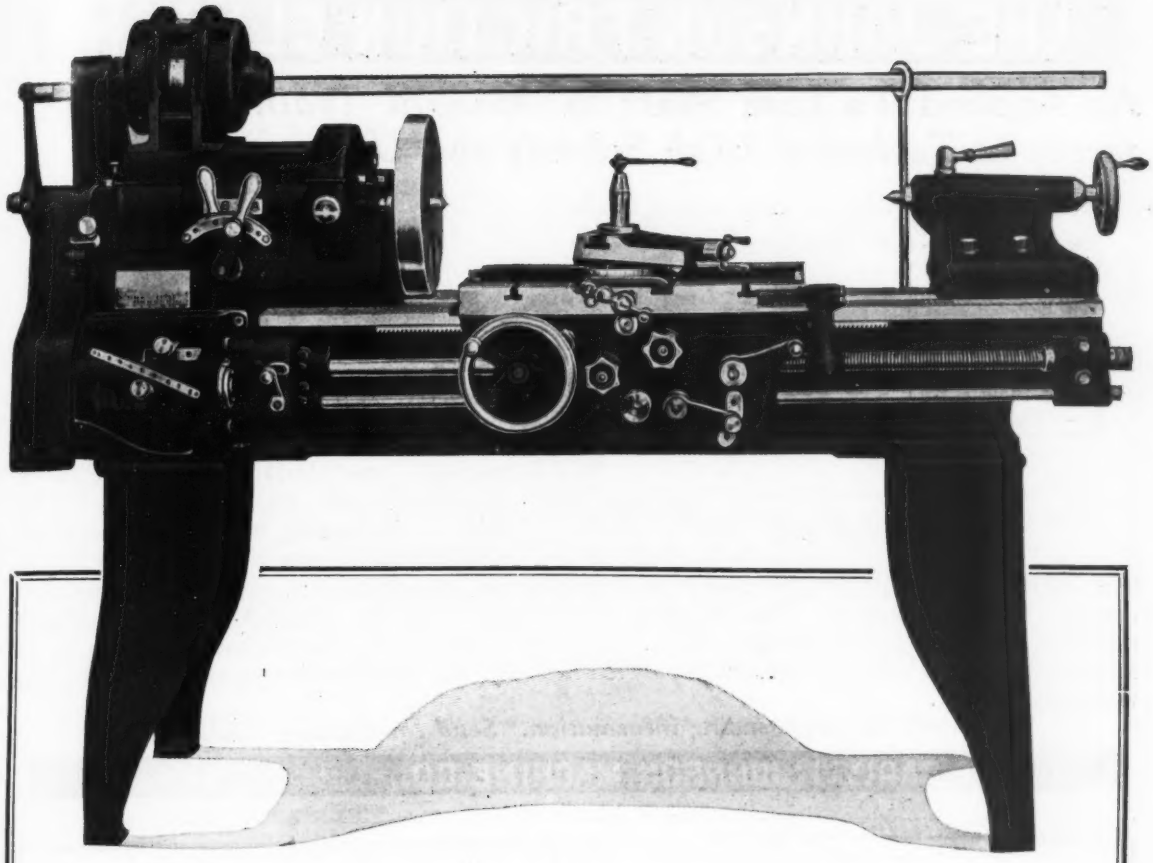
**Little Giant Double Grip Drill Chuck**

## Mainly About Your Classes

If you are not using Westcott Chucks now, you should certainly give your boys this advantage. Their best work can only be accomplished on the best equipment. Specify Westcott Chucks on your next order—in the meantime send for our catalogue.

***Manufacturers of chucks for every class of work.***

**WESTCOTT CHUCK COMPANY**
**Oneida, New York**



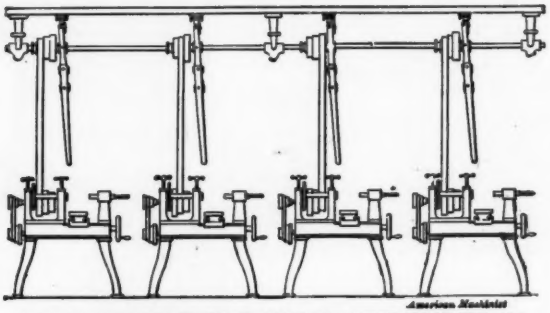
14″x6′ Monarch Motor Driven Lathe. One of the very finest lathes in the world. Hundreds in use in Vocational Schools. Smaller and larger sizes of Monarch Lathes fit every school requirement. Let us submit prices.

**The Monarch Machine Tool Co.**

**304 Oak Street** **Sidney, Ohio**

# THE JOHNSON FRICTION CLUTCH

## As Applied To Line Shaft In *Manual Training Departments* In *Technical High Schools* and *Universities.*



LINE SHAFT DRIVE WITH CONE PULLEYS MOUNTED ON CLUTCH HUBS.

Countershafts are expensive. Note the saving: one JOHNSON FRICTION CLUTCH, one BELT and one PULLEY. The pulley can be a cone, steel split or solid iron.

The JOHNSON FRICTION CLUTCH has no protruding parts to catch and cause accidents. Another saving. The Driving Collar used with the JOHNSON Single Clutch obviates the necessity of splined shaft. Another saving. Standard Clutches from 3/4 in. bore to 3-3/16 in. bore by sixteenths carried in stock for immediate shipment. This saves time and money.

***Write for more saving information. Send for Catalog "IAM."***

**THE CARLYLE JOHNSON MACHINE CO.** MANCHESTER CONN.

# JOHNSON GAS APPLIANCES

Require No Forced Air Blast

No. 101 Bench Furnace

Temperatures up to 1800° are easily developed in this Bench Furnace. The Johnson Patented Direct Jet Regulator does it without the expense of a blower.

Furnaces made in many styles and sizes, for heat-treating, soldering, metal melting.

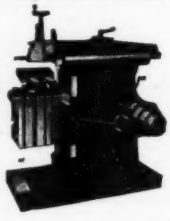
*Send today for our illustrated booklet of Gas Appliances; shows temperatures, colors, etc.*

**JOHNSON GAS APPLIANCE CO.**
Cedar Rapids IOWA

# SHAPERS MILLERS ENGINE LATHES

14"x6'—$400.00
16"x6'— 450.00
With Quick Change Gear Box $85.00 extra

Moderate price machine tools — practically fool proof — ideally suited for school shops. Thousands in use all over the world giving daily satisfaction.



Descriptive catalogue and full particulars furnished upon request.

**Industrial Education Department**

## THE JOHN STEPTOE CO.

CINCINNATI :: :: OHIO

# *Lending a Helping Hand in Your Profession*

## *Awards for Every Writer of an Essay*

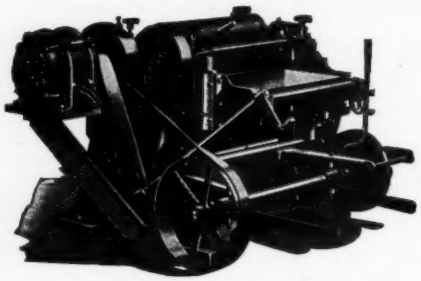
Over ten thousand dollars in cash and valuable prizes to every eligible contestant. Instructors and Directors of vocational training and those directly interested in the development of boys in the woodworking and cabinet making departments have an opportunity to participate in the unusual educational campaign.

We believe that cabinet making is replete with possibilities for character building, for mental and cultural development. We want you to tell us what you think of this idea, what you are doing or propose to do to emphasize the cultural side of cabinet making in the training of your boys.

Every teacher who sends us 500 words or more on this subject will be rewarded for his endeavor. The best thoughts on the subject will be bound in book form and distributed broadly throughout the country. And essays considered worthy of entrance into this book will be awarded special cash prizes according to their merit to be established by a board of Judges, consisting of three men high in the vocational field.

*Write today for our booklet "Details of Essay Contest"*

EDUCATIONAL DEPARTMENT
AMERICAN WOOD WORKING MACHINERY CO.
ROCHESTER, NEW YORK, U. S. A.



CRESCENT WOOD WORKING MACHINERY in your wood working department will give the same satisfactory service that the machines are delivering in thousands of factories throughout the world.

Send today for catalog of band saws, saw tables, jointers, borers, disk grinders, planers, planers and matchers, swing saws, cut off tables, shapers, mortisers, variety wood workers, universal wood workers.

**The Crescent Machine Co.**

25 Main Street

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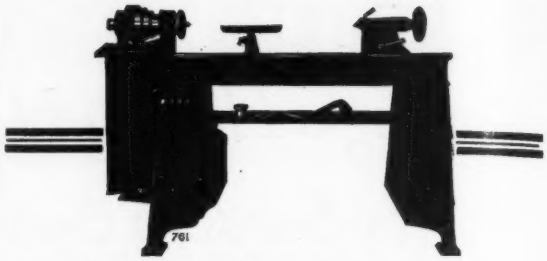

**UNUSUAL!—**

***in its safety features***

Although safety is only one of the many fine features incorporated in the "American" High Speed Ball Bearing Lathe and other "American" wood working and manual training machinery, it is the feature that appeals most to superintendents and teachers charged with responsibility for the safety of their classes.

In addition to safety—ruggedness and simplicity of control are also inherent in "American" manual training equipment.

Our catalog should be in your library. Write for it today. It lists and describes the full "American" line, which includes saw benches, jointers, planers, band saws, wood workers and other manual training machinery.

**American Saw Mill Machinery Company**

74 Main St. Hackettstown, N. J.

**AMERICAN**

MANUAL TRAINING EQUIPMENT

V & B Supersteel Hammers are equipped with Vaughan's Expansion Wedge—positive insurance of a tight handle and head. Tool heads are drop forged from a solid bar of Vaughan's Supersteel, Ebony Finished and trademarked V & B in etched gold. A fine tool that will appeal to the man who takes pride in his work.

**VAUGHAN & BUSHNELL MANUFACTURING COMPANY**

*Makers of Fine Tools*

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STANDARD CARRIAGE CLAMP.

ADJUSTABLE CARVERS' CLAMP.

PERFECTION STEEL BAR CLAMP.

*Send for catalog showing our complete line. A Clamp for every purpose and many other useful tools.*

Ask your dealer for HARGRAVE QUALITY TOOLS

**THE CINCINNATI TOOL CO.**

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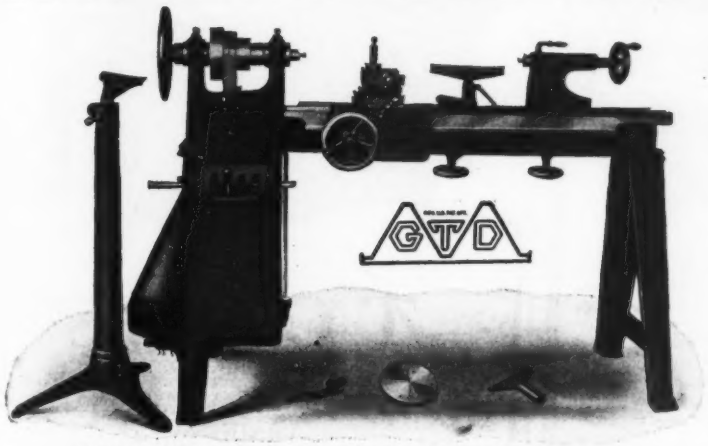
CINCINNATI, OHIO

# Select YOUR Lathe From Our Full Line




No. 218 GTD Demonstration Lathe—for wood or steel.

When you buy anything—big or little—you like to select the thing best suited to your own requirements, and not be limited in your choice to one or two possibilities.

And so in buying and specifying lathes—be sure that you have our Lathe Booklet, showing plain Speed Lathes, Manual Training Lathes, with overhead, individual motor or underneath shaft drive. Demonstration Lathe for teachers, Bench Lathe, etc.

Our many years' experience in manual training lathe manufacture is at your disposal—and the hundreds of schools all over the country which are completely or in part GTD equipped testify to the excellence of our Lathes.

*If you are in any way interested or responsible for the purchase of vocational equipment, or the greater success of vocational classes, write* **now** *for our catalog on lathes.*

GREENFIELD TAP AND DIE CORPORATION
GREENFIELD, MASSACHUSETTS

## HUTHER BROTHERS DADO HEAD

***The Saw That Has Helped Make New Production Records in Many Plants.***

Intricate cutting and grooving is simplified and expedited by the use of this remarkable device.

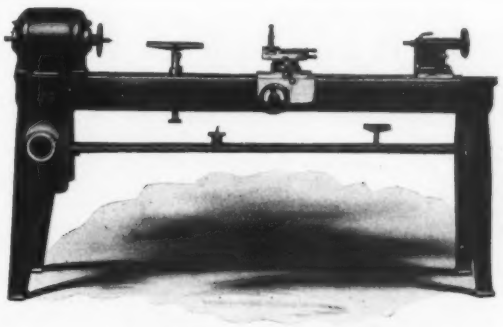
It consists of two outside cutters which can be used in conjunction with as many inside cutters as are necessary to perform the required cut.

We were the original patentees of this type of saw. Into it goes all the workmanship and knowledge of saw making gained from our experience of fifty years.

**Send for one on approval. It may be returned at our expense if unsatisfactory.**

**Illustrated catalogue sent promptly on request.**

**HUTHER BROS. SAW MFG. CO.**
**Rochester, N. Y.**



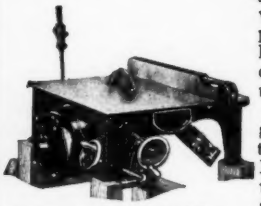
## Motor Headstock Lathes

These are the highest development in Manual Training School Equipment. We build lathes of this type suitable for either direct or alternating current. Motors are ball bearing and have convenient speed regulating dials and snap switches. Convenient to operate and every provision made to guard against injury to operator or motor.

We build a complete line of Manual Training Equipment and have a special catalog which will be sent on request.

**HALL & BROWN WOOD WORKING MACHINE CO.**
**Broadway, Tyler, Ninth Streets,**
**ST. LOUIS, U. S. A.**

## The Up to Date Woodworking Shop



Wallace Bench Universal Saw
Wallace Bench 6" Jointer
Wallace Bench Plain Saw
Wallace Bench 4" Planer
Wallace Bench 16" Bandsaw
Wallace Bench Glue Pot
*with Automatic Heat Control*

Since 80% of all fitting, cutting, planing and assembling in the average woodworking shop is on pieces less than 6 feet long, Wallace Bench Machines are found in every up-to-date shop.

Your students can profit greatly if given the opportunity to operate Wallace Bench Machines. Follow the example of 500 other schools that have installed them. For extreme accuracy, speed, convenience and safety Wallace Machines lead the world.

Send for descriptive bulletins.

**J. D. Wallace & Co.**
1415 W. Jackson Blvd.,
Chicago, Ill.

# TOOLS

FOR

MANUAL AND VOCATIONAL TRAINING

For many years we have supplied high grade Tools and Benches to Schools, Colleges and Institutions, furnishing only the representative and guaranteed makes.

Have you our 300 page Catalog of Tools, Hardware and Supplies? If not ask for Catalog No. 238.

**HAMMACHER, SCHLEMMER & CO.**
NEW YORK Since 1848 4th Ave. and 13th St.

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## SHELDON WORK BENCHES

will be of first importance in placing the industrial department of your school in the first rank. They have established a recognized standard for quality and design.

**E. H. SHELDON & CO.**
Muskegon, Michigan
(Send for catalogue)

MANUFACTURERS OF FURNITURE FOR

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| Manual Training | Art | Mechanical Drawing |
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# EFFICIENCY GRINDER

"BUILT LIKE AN AUTO-MOBILE" UP-TO-DATE

POWERFUL
EFFICIENT
CONVENIENT

A modern slow speed oilstone grinder—ideal for school shops. Independent rests and gauges make for correct grinding angles.

Any ten year old boy can grind tools correctly on this machine.

At our prices you cannot afford to be without this machine.

**EFFICIENCY GRINDER COMPANY**
326 WEST WASHINGTON AVE.
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WORTH WHILE

PEXTO

MACHINES AND TOOLS
*For*
SHEET METAL
WORK

If not already equipped, eventually you will join some four hundred progressive schools in voicing favorable expression for what this course offers and how Pexto equipment has helped to make the work a success.

*Our Engineering Department is at your service.*

**THE PECK, STOW & WILCOX CO.**

SOUTHINGTON, - CONN.

# Overlook This

and you overlook one of the best courses for Manual Training Workshops

A large number of the foremost schools in the country (public and private) have come to realize this fact and are teaching ***Sheet Metal Working*** in their Manual Training Department. They realize sheet metal is rapidly taking the place of wood in most every industry and mechanics knowing this trade are in great demand.

The work is healthful, the hours short, and pay ranks high among the best paid trades.

The initial equipment required costs far less than any other equipment you could install considering the results obtained. The supplies necessary to carry on the course cost very little.

We will be glad to furnish an estimate on sufficient machines and tools to cover your needs upon receipt of number of pupils to be taught.

**At least send for literature on the subject.**

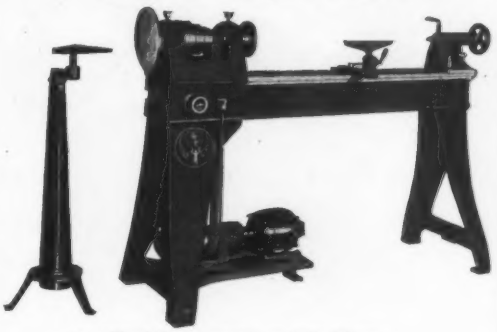
## BERGER BROS. CO.

"EVERYTHING FOR THE TRADE"

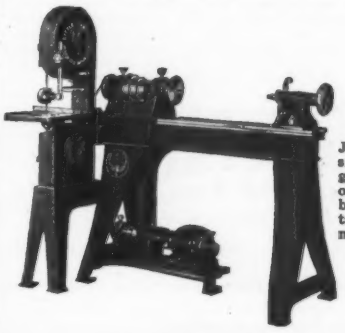
229-231-233-235-237 Arch Street,
PHILADELPHIA.

# LITTLE GIANT

## MANUAL TRAINING DEPARTMENT SPECIAL EQUIPMENT

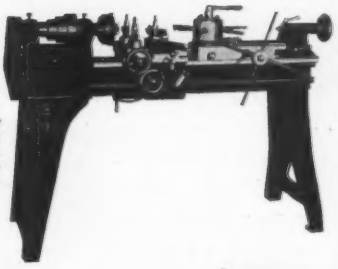


Wood Lathe—motor or belt driven.



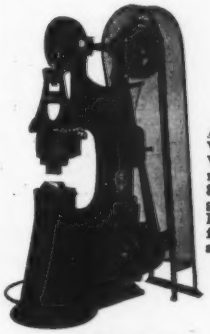
Combination Wood Lathe and Band Saw.

Jointer, planer, jigsaw, sander, buffer, grinder, mortiser and other equipment can be furnished and attached in a similar manner.



Metal Lathe—Motor or Belt Driven.

Miller, planer, gear cutter, grinder and other equipment can be furnished and attached the same as with wood lathe.



Power Hammer—Motor or Belt Driven.

All Little Giant Wood and Metal Working Equipment is sold on 30 days' trial, and guaranteed FOREVER against defective material and workmanship.

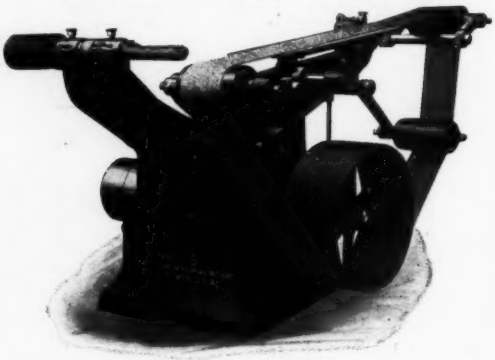
Band Saw—Motor or Belt Driven.

## LITTLE GIANT COMPANY

Established 1876

223 Rock St. Mankato, Minn., U .S. A.

# Every School Shop
## Needs a Belt Sander



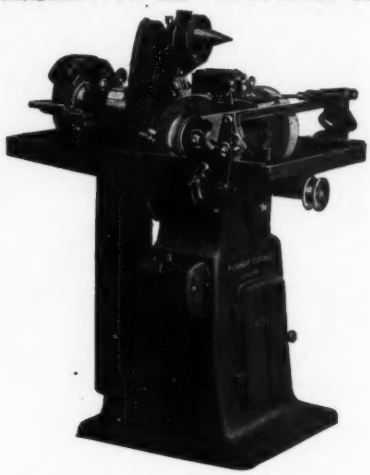
THIS Variety Belt Sander is well suited for the school shop. It can be set up in many different ways to accommodate practically any sanding application on work which can be manipulated freehand against the open sand-belt, rolls, table platen, shaped forms, pneumatic drums or solid spindles. It is self-contained, requiring no countershaft, occupies small floor space and consumes little power.

*Send for folder showing various set-ups.*

**MATTISON MACHINE WORKS**
Rockford, Illinois, U.S.A.

CHICAGO GREENSBORO, N. C. NEW YORK SAN FRANCISCO

# MUMMERT-DIXON OILSTONE GRINDERS
**The Modern Edge Tool Sharpening Machines**
THE STANDARD FOR ALL INDUSTRIAL SCHOOLS



No. 481—Motor or Countershaft Drive.

An automatic attachment for grinding long knives can be furnished with this machine.

THE FIVE LEADING FEATURES
1. Coarse Oilstone Wheel
2. Fine Oilstone Wheel
3. Grinding Cone
4. Leather Wheel
5. Emery Wheel

ALL AT YOUR FINGERS' ENDS

*Send for full descriptive bulletin*

**MUMMERT-DIXON CO.**
Hanover, Pa.

Tannewitz QUALITY

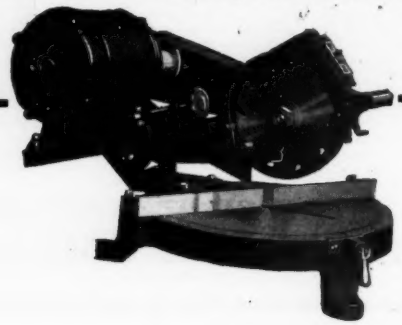
## Tannewitz Portable Bench Saw
"The Precision Tool Of A Thousand Uses"
Adapts itself with astonishing facility to the needs of all high class institutions.

**What It Is.** Motor and saw are mounted on a special frame swiveling 45 degrees in either direction. Thus, both right angled and oblique cuts may be made. Plugs into nearest lighting socket. Accurate gauge and locking device permit difficult bevels to be produced almost instantly and with unfailing accuracy.

**What It Does.** The TANNEWITZ Portable requires less power and less floor space than any other, and is the safest saw on the market. Greatly reduces time, labor and trouble of minor operations. Ample capacity for all ordinary work. A thoroughly well made tool with more exclusive precision features than any other.

Our special bulletin is free for the asking—write for it.

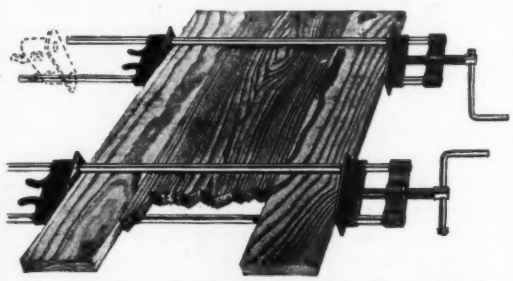
**THE TANNEWITZ WORKS**
305 Front Ave., N.W., Grand Rapids, Mich., U.S.A.



# HARTFORD CLAMPS HOLD THEIR GRIP

*because they are built with just one thought in mind—*

## EFFICIENT PERFORMANCE



There is no surer way of holding your students' interest than to supply them with first-class "real man's" tools.

One distinctive feature of the HARTFORD DOUBLE BAR CLAMP is that it prevents "buckling."

Boys know that when their work buckles, it means more labor and a poor job in the end—hence their preference for Hartford Clamps.

Give them the best of everything—including clamps. Send for catalog No. 10 which contains complete price list on Single and Double Bar Clamps, Hand Screws and "C" Clamps.

**HARTFORD CLAMP CO.**
308 Pearl St. Hartford, Conn.

# SIMONDS SAWS

Expert mechanics and finest crucible steel make Simonds Saws the best that can be found. Whether it be Band, Circular or Hand Saws you require for the school shop, you will save money and get better results if you equip with Simonds.

*Write for catalog and prices*

## Simonds Saw and Steel Co.

*"The Saw Makers"*

Fitchburg, Mass.
5 Factories

Chicago, Ill.
12 Branches

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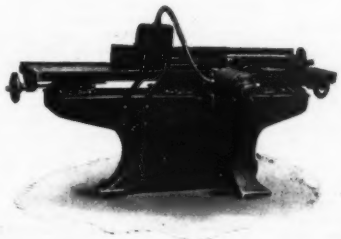
Established 1847 — Incorporated 1878

## Woodworking Machinery

Improved
HAND PLANER OR JOINTER
Made in
Several Sizes



Rear-side View to Show the Application of Motor Direct on Cutter-Head Spindle of Suitable Size, 3600 R.P.M. with Starters.

ADDRESS

## H. B. Smith Machine Co.

Smithville, N. J., U. S. A.
Or Nearest Branch
NEW YORK CHICAGO ATLANTA SAN FRANCISCO

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## UNION PORTABLE

Combination Universal Saw Bench and Six Inch Jointer

6" Jointer
16" Band Saw
Universal Saw Bench
Plain Saw Bench
4" Jointer
Single Spindle Shaper
Comb. Universal Saw and 6" Jointer

THEY ARE ON WHEELS
Take the machine to the job

Also Furnished As BENCH TYPE MACHINES.

We recommend machines with the base which makes them conveniently portable.

All machines equipped with suitable motor with convenient switch to start or stop. Any lamp socket acts as your power supply line. Safety provisions have been taken care of to the absolute limit.

Send for Bulletin and Prices

## GALLMEYER & LIVINGSTON CO.

SUCCESSORS TO UNION MACHINE CO.
20 Campau Avenue, N. W.,
GRAND RAPIDS MICHIGAN, U. S. A.

# CLASSIFIED WANTS DEPARTMENT

**The rate for classified advertisements is $.07 per word per insertion, payable in advance. All wants subject to approval. Minimum 25 words. Forms close on 5th of the month preceding date of issue. Write for discount on yearly insertions.**

### APRONS.

**Goodrick Student Aprons**—size 29"x36"—brown, 60c; white, 50c. Instructor's apron gratis with first order of twelve or more. Shop coats, $4.90. Canvas Products Corporation, Fond du Lac, Wisconsin.

### ART-GLASS

**"Hard-To-Get" Materials**—Pulls and Catches, Leg Sockets, Tea Wagon Wheels and Casters, Tray Handles, Costumer Hooks, Steel Rails for Wood Beds, Trays for Smoking Stands, Art Glass, Chair Cane, etc. Write for Catalog. Thurston Manual Training Supply Co., Anoka, Minnesota.

### BASKETRY

**Basketry Materials**—We have everything for basket making, including reeds, willow, chair-cane, Indian splints, ash splints and wooden bases. Send Fifteen Cents for Samples, 65-page Catalogue and directions. This contains illustrations of over 500 baskets, trays, frames, etc., with suggestions as to making them. Louis Stoughton Drake, Inc., 33 Everett St., Allston, Boston 34, Mass.

**Everything for Elementary Handwork** — Also for basketry, weaving, bookbinding and chair caning. Mounting boards, Walderaft dyes, crayons, burlap, scissors, punch and eye sets. Thomas Charles Co., 2249 Calumet Ave., Chicago.

**Basketry Material**—Reed, Raffia, Bases, Pine Needles, Ash Splints, etc. Free Basketry Catalogues. J. L. Hammett Company, Cambridge, Mass.

**Basketry Materials**—We carry a complete line of basket making materials including Kindergarten reeds, all sizes, round and flat, in one pound packages. Our line includes raffia, French willows, straw braids, Hong Kong twisted grass, basket bases, rattans, chair cane, etc. The Jayson Company, Inc., 217 Mercer St., New York City.

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**Manual Arts Supplies**—Circular and straight knitters. Bookbinding Material, Bead Looms, Stencilling, Stick Printing and Batik Supplies, Wooden Napkin Rings, Plasticine, Flower Pot Moulds. Free Manual Arts Catalogues. J. L. Hammett Company, Cambridge, Mass.

### BLUE PRINTS

**Blue Prints** of 16 Machine Shop Problems for Vocational Schools. 50c the set. Edward Moeser, 29 Rey St., Buffalo, N. Y.

### BRUSH MAKING

**Special Sample Offer of Brush Materials**—15 Brush Blocks, 7 different styles and materials, price complete, postpaid, $6.00 net cash. Magnus Brush Materials, Dept. K, 165 N. Jefferson St., Chicago.

**Brush Makers' Materials** — Complete line of brush makers' materials, horse hair, tampico, bassine, brush blocks, handles, wire, etc. Samples on application. Established 1873. Chas. H. Feldstein Co., Inc., Philadelphia, Pa.

### CANING

**Finest Quality**—We have cane, reed, webbing, flat rush, for all kinds of chair caning. Send Fifteen Cents for Samples, Directions and Catalogue. Louis Stoughton Drake, Inc., 33 Everett St., Allston, Boston 34, Mass.

### CATALOGUE.

**The most complete catalogue ever issued. Four hundred illustrations. Copy gratis. National Manual Training Supply Company, 322 South Fourth Street, Minneapolis, Minnesota.**

### CABINET HARDWARE

**Cabinet Hardware** and Upholstery Supplies for Manual Training. Latest period and mission pulls, costumer hooks, wood knobs, tea wagon wheels, electric cluster posts, cedar chest fittings, mirrors, wood dowels, Seng bed equipment. Complete line Stanley tools. Send for catalog. Ohio Vocational Supply Co., Wapakoneta, Ohio.

**Special Service**—We make it a rule to give special service on Cabinet Hardware for teachers. Send a postal today for our catalog. F. A. Rauch & Co., 410 S. Market St., Chicago, Ill. In one line of business for 40 years.

**"Hard-To-Get" Materials** — Chest Trimmings (Solid Copper Bands and Fancy Designs, Coppered Nails, Locks, Hinges, Handles, Cover Supports, etc.). Small Box Hardware, Screen Hinges, Glides and Casters, Dennison Glue, Johnson Stains, Stanley Tools. Catalog to Instructors. Thurston Manual Training Supply Co., Anoka, Minnesota.

### CEMENTERS' TOOLS

**Students should use** the best Plasterers, Masons, Cementers, Tile-Setters, Plaster-Modelers, Terra-Cotta Workers and Stone-Cutters Tools. Write for Complete Catalog. Goldblatt Tool Co., Schools Dept., 1522 Walnut Street, Kansas City, Mo.

### CLOCKS

**Clock Movements**—chimes, dials, part of cases in the knock down, blue prints, designs, instructions, in fact, all assistance required by manual training teachers. Write for free booklet today. American Clock Company, Nicetown, Philadelphia, Pa.

### CUSHIONS

**We manufacture cushions in all types of filling and upholstery. Standard sizes or to your specifications. National Manual Training Supply Company, 322 S. 4th St., Minneapolis, Minn.**

### DRAFTING

**Catalog G.**—New illustrated catalog on Drawing Stands and Drafting Tables. Suitable for Schools, Drawing Classes, Artists, Draftsmen and Engineers. The Washburn Shops of the Worcester Polytechnic Institute, Worcester, Mass.

**Drawing Paper**—Our Royal White—size 14x17 at $4.64 per ream of 500 sheets; 17x22 at $7.20; 19x24 at $7.28; 22x30 at $9.95; samples on request. Ritzmann, Brookes & Co., Chicago.

**The "CYMA" Compasses** are highly recommended by High School Drawing Instructors. They combine Lead, Pen, and Divider Points, all in one—no loose pieces—low price. Circular free. Sample sent for inspection. E. Bourquin, General Distributor—1353 Main St., Waltham, Mass.

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**For quick results, use the Classified Wants Section. Industrial-Arts Magazine, Milwaukee, Wis.**

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### FIBRE CORD

**Have full line fibre cord including wire cord and wire filled stakes for your manual training, finest material for your basketry and other weaving. Prices and samples furnished. Fibre Grand Co., Inc., Shawmut and Indiana Ave., Grand Rapids, Michigan.**

**See our full page advertisement regarding our complete Art-Fibre Weaving Service. Art-Fibre Cord, Stakes, Furniture Frames, Finishes, etc. Write for our catalog of designs. Grand Rapids Fibre Cord Company, Grand Rapids, Michigan.**

### GLAZES

**Judson T. Webb,** formerly instructor in pottery at the Art Institute of Chicago, has located his laboratory and pottery supply business at 1710 W. 99th St., Chicago, Ill., Beverly Hills. He is prepared to furnish his glazes and colors, also clay, pottery tools and his potter's wheel. Send for new circulars. Judson T. Webb, 1710 W. 99th St., Chicago, Ill., Beverly Hills.

### LAMPS

**Artistic Parchment Shade Making by Our Simple Method**—Provides an interesting subject and an ideal medium for color and design instruction. Beautiful Parchment Shades for the home that are inexpensive. A splendid opportunity to engage in a most profitable business. We furnish Shade Material cut to fit frames in various styles, designed ready to color, or blank. Send for Special Introductory Offer. United Arts Company, Manufacturers and Importers, 355 East Water Street, Milwaukee, Wis.

### LEATHER

**Leather for Bags, Cases, Pocketbooks, Fancy Leather Goods and Novelties. Wilder & Company, 226-228 W. Lake St., Chicago.**

**Leather**—We have a fine line of leather and imitation leather ready for immediate shipment. Write us your wants today. F. A. Rauch & Co., 410 S. Market St., Chicago, Ill. In one line of business for 40 years.

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**The Improved Ames Lettering Instrument is now ready for delivery. Write for free descriptive blue print and leaflet. The instrument reduces the time required in mastering lettering. There should be at least three in every drawing room. Ask your dealer about them or write direct to The O. A. Olson Mfg. Co., 706 Wilson Ave., Ames, Iowa.**

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**NEWCOMB Automatic, Fly-Shuttle, Hand Looms for Educational, Vocational and Commercial Purposes. Write for Catalog—Newcomb Loom Co., 474 Taylor St., Davenport, Iowa.**

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**Pottery Supplies and Equipment**—Kilns, Clay Modeling Wheels, Tools, Plaster Models, Moulds, Stilts, Pyrometric Cones, Modeling Plaster, Metallic Oxides, Chemicals. Prompt shipments. Write for new Pamphlet. Wm. W. Wilkins, Lewis Institute, Chicago.

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**Modelling Materials**—Plasticine, never hardens, Antiseptic, Ten Colors. Send for free sample. J. L. Hammett Company, Cambridge, Mass.

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CABLE ADDRESS "GRAPHITE, JERSEY CITY"

ESTABLISHED 1827 INCORPORATED 1868

TO DRAWING TEACHERS:

Try me and see

how good I am.

For, between you and me, I admit I think I'm rather good. Otherwise, I should not be addressing you.

I know I was carefully brought up in a famous family, and that great things are expected of me.

Since I was sent out a year ago to earn a living, I have done some things that are set down to my credit: this is only truth-telling, not boasting.

Still, whatever I may think or say about myself, or what I've done; no matter what anyone else may think or say - when it comes to buying colored crayons for use in your Schools, you are going to decide whether it is to be me or somebody else for the job.

That is why I say, "Try me and see".

That is why you are invited to send for a sample of me.

Respectfully,

Ed. U. Cator

P. S. Do you wish me in the 8-color tuck box, or metal box: what about the larger boxes - 12, 16 and 24 colors?

Note: Address me c/o Joseph Dixon Crucible Company, Jersey City, N. J.

# CLASSIFIED WANTS DEPARTMENT

**The rate for classified advertisements is $.07 per word per insertion, payable in advance. All wants subject to approval. Minimum 25 words. Forms close on 5th of the month preceding date of issue. Write for discount on yearly insertions.**

### PHONOGRAPHS

**Perfection phonograph motors, tone arms, cabinets, etc., are the finest and highest grade manufactured at the lowest possible price. Pamphlet on cabinet construction for Manual Training Schools, and catalog of equipment free. Federal Supply Co., Indianapolis, Ind.**

**Build Your Phonograph.** Quality phonoparts. Famous Serenado Motors. Quality Serenado motors and motors of other types. Electric Motors, tonearms, reproducers, amplifiers, case material, accessories. Free, blueprints and building instructions. Big saving. Wonderful results. Prompt delivery. Schools given special consideration and aid in phonograph construction. Catalog mailed for ten cents. Hoosier Manufacturing & Supply Co., 312 Baldwin Block, Indianapolis, Indiana.

Build a genuine Choraleon Phonograph and save one-half. We furnish motors, tonearms, blue prints, instructions and parts. Send for catalogue and free blue print offer. Also full line Radio supplies, Radio cabinets. Veneer stock. Choraleon Phonograph & Radio Co., 423—20th St., Elkhart, Ind.

### REED AND RAFFIA

**Free Samples**—We will send you free samples of all our reeds and raffia for school use. Catalog and directions, 15 cents. Louis Stoughton Drake, Inc., 33 Everett St., Allston, Boston 34, Mass.

**Reed, Raffia and Chair Cane**—Aviation quality, submarine prices. Reeds for kindergartens a specialty. Peter A. Wagner & Son, 1224-26 N. Marshall St., Philadelphia, Pa.

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**Samples**—We will gladly send you Free Samples of our line of upholstering goods on receipt of inquiry. F. A. Rauch & Co., 410 S. Market St., Chicago, Ill. In one line of business for 40 years.

**Upholstery goods,** furniture supplies, tapestries, etc. Everything for the furniture trade. Manufacturers of cushions of every description. Samples and prices sent on request. J. N. Rautio Co., Fargo, N. Dak.

**"Hard-To-Get" Materials**—Upholstery Supplies, Cushions, Mirrors, Cabinet Hardware, etc. Catalog to Instructors. Thurston Manual Training Supply Co., Anoka, Minnesota.

### TAPESTRIES

**We have a wide variety of Tapestries and Velours, in all sizes, styles and designs. It will be a pleasure to send samples. Write us your wants. F. A. Rauch & Co., 410 S. Market St., Chicago, Ill. In one line of business for 40 years.**

### TYPE

**Wood Type, Metal Type, Printers' Supplies.** Mfd. by Empire Type Foundry, Delevan, N. Y. (Est. 29 Years.) Ask for Catalog 17.

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**Weaving Supplies** — Looms, Roving, Jute, Warp, Macreme, Belfast Cord, etc. Free Weaving Catalogues. J. L. Hammett Company, Cambridge, Mass.

### WANTED

**Wanted**—Manual Training Teacher, girl preferred, for Boys' Industrial Training in Special Classes. Address Director of Hygiene, Court House, St. Paul, Minn.

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We have purchased 122,000 pair U. S. Army Munson last shoes, sizes 5½ to 12, which was the entire surplus stock of one of the largest U. S. Government shoe contractors. This shoe is guaranteed one hundred per cent solid leather, color dark tan, bellows tongue, dirt and waterproof. The actual value of this shoe is $6.00. Owing to this tremendous buy we can offer same to the public at $2.95. Send correct size. Pay postman on delivery or send money order. If shoes are not as represented we will cheerfully refund your money promptly upon request. National Bay State Shoe Company, 296 Broadway, New York, N. Y.

**WEBER**
**School Drawing Equipment Is Unexcelled**

Sphinx and Cosmos Round System Drawing Instruments have met with phenomenal success.

A complete line of Drawing Tables, Boards, T-Squares, Triangles, Scales, Drawing Inks.

**ART MATERIALS**

Let us have your next term's proposals now so that we can give you our best quotations.

**F. WEBER CO.**

Established 1854
1220 Buttonwood St.
1125 Chestnut St.
PHILADELPHIA, PA.

227 Park Ave.
BALTIMORE, MD.

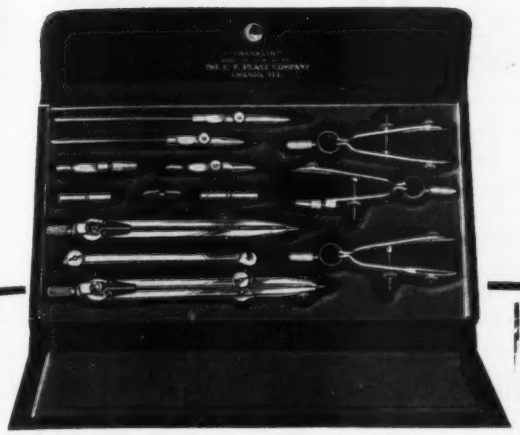
705 Pine St.
ST. LOUIS, MO.

**Save $12.00**

**Build this Radio Receiver and Detector**

Complete price $25.00. All parts to assemble, except cabinet, $13.00. Blue prints of the following 25 cents each, or all for $1.25: Crystal Detector Receiver, Audion Detector, Non-Regenerative Receiver, Regenerative Receiver, 2-step Audio Amplifier, Radio Amplifier. Catalog free.

**Tribune Airfone Company**
Dept. K Owego, N. Y.



## Durability and Precision

are built right into Pease "Franklin" American Made Drawing Instruments and they are so carefully manufactured that every part is interchangeable with the like part. Made of nickel silver and tool steel—easy to handle—priced right.

***Send Us Your Requisitions***

on your requirements for next year and we will be particularly glad to quote prices. We have special educational discounts. May we quote and show you samples? Write for Catalog F-D-02.

**THE C. F. PEASE COMPANY**
**802 N. Franklin St., Chicago, Ill.**

## QUALITY FINISHES

WILL always be secured through the use of our woodfinishing materials. TONS and TONS of our stains are consumed each year by the furniture industry, a pretty good proof of their quality and uniform results.

WE offer to schools exactly the same products, and take pleasure in recommending the following popular shades:

**ONE POWDER WATER SOLUBLE STAINS**

| | |
|---|---|
| Brown Mahogany | No. 448 |
| Brown Mahogany | No. 272 |
| Red Mahogany | No. 449 |
| Red Mahogany | No. 9 |
| American Walnut | No. 2067 |
| Italian Walnut | No. 503 |
| Two Tone Walnut | No. A-804 |
| Italian Oak | No. 952 |

**LIQUID ACID STAINS**

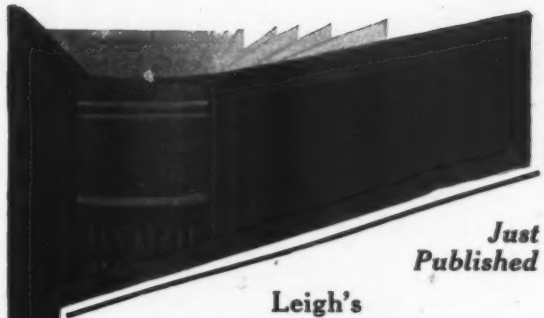
| | |
|---|---|
| Gray Oak | No. 19 |
| Fumed Oak | No. 264 |
| Gray Pine | No. 49 |

**LIQUID OIL STAINS**

| | |
|---|---|
| Golden Oak | No. 999R |
| Weathered Oak | No. 69 |
| Early English | No. 68 |
| Jacobean | No. 12 |

IT will be a pleasure to send you complete information on our stains and woodfinishing outfits, and to list your name for "WOOD FINISHING BULLETINS." You will find them helpful.

**Grand Rapids Wood Finishing Co.**
**61-71 Ellsworth Ave., Grand Rapids, Mich.**



***Just Published***

**Leigh's**

## Practical Mechanics

**and**

## Strength of Materials

BY CHARLES D. LEIGH

Associate Professor of Mechanics Armour Institute of Technology.

293 pages; 5x7½; 22 illustrations, $2.25.
A McGraw-Hill Book.

A simple, direct presentation of those principles of mechanics and strength of materials essential for the practical man.

The book develops mechanics and strength of materials as one continuous subject: each chapter on strength of materials is preceded by those principles of mechanics necessary for its presentation.

It is intended as a text for evening schools and vocational schools.

It presents mechanics and strength of materials together in a logical order, which teaching experience has proved makes the subject more interesting, saves time, and gives the student a better grip on the practical side of the subject.

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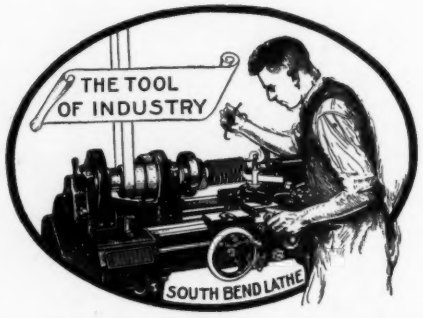


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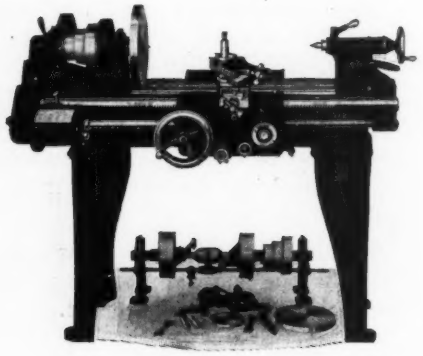

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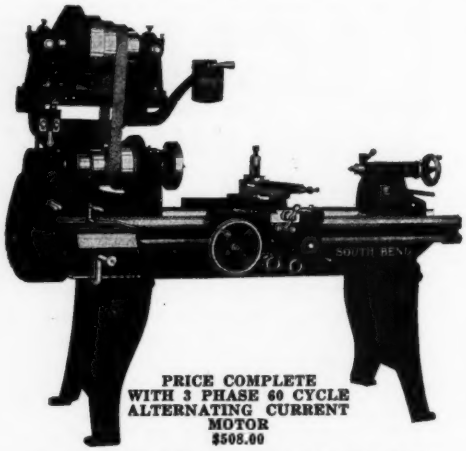

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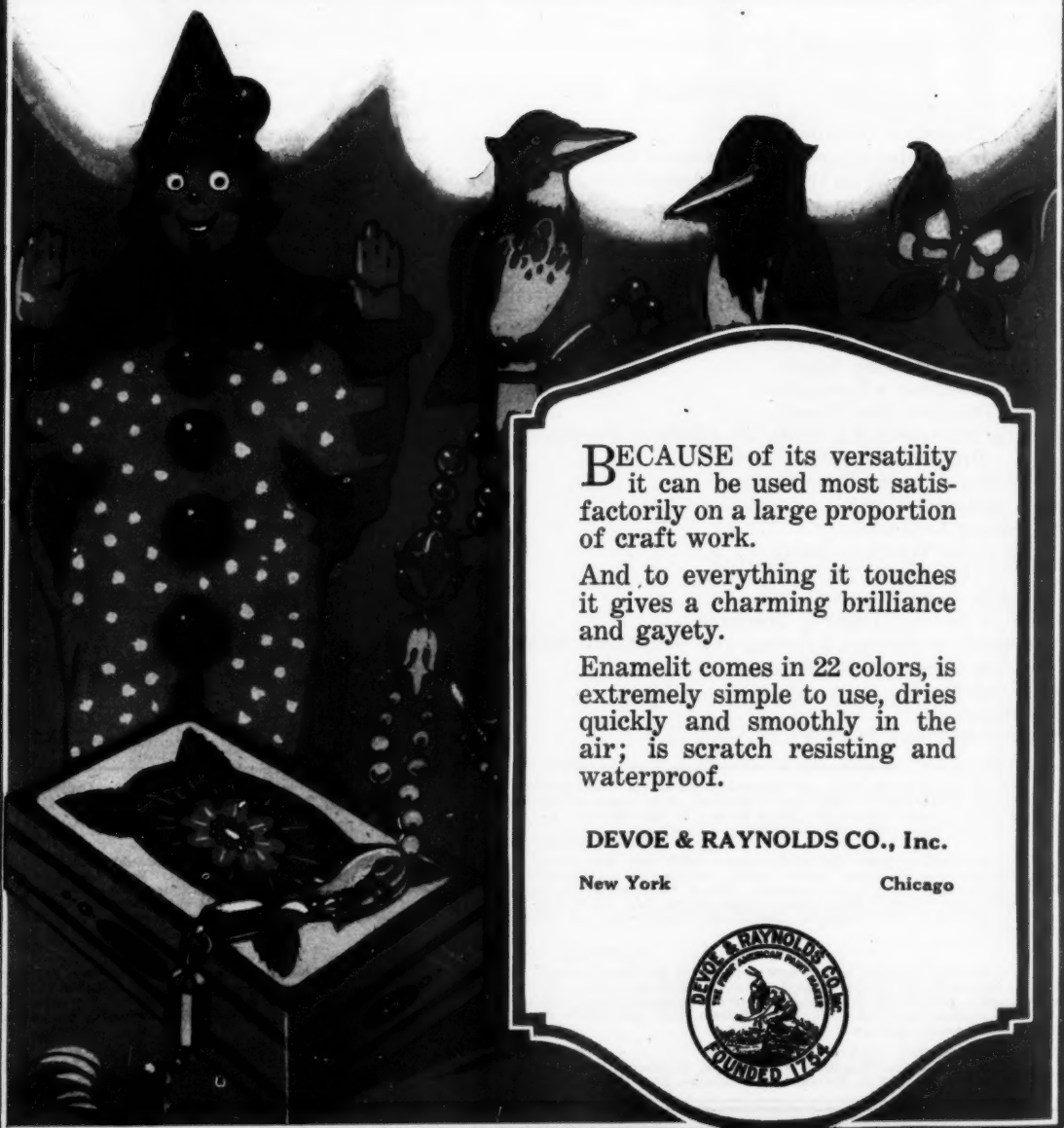

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INDUSTRIAL-ARTS MAGAZINE

Volume XII APRIL, 1923 No. 4

# The Enrichment of Manual Arts

**Arthur B. Mays, Associate Professor of Industrial Education,**
**University of Illinois.**

WITH the renewed attacks on industrial education, which are being pushed with special vigor by certain groups of educators, manual arts is again having to defend its position in the schools in many communities. With the urgent call for economy and for reduction in public expenditures, school boards are scrutinizing every department of work with the object of reducing or eliminating any type of activity which can not prove the necessity or importance of its continuance. Those types of work, however valuable, which are not clearly contributing to the generally accepted purposes of public education are likely to experience much difficulty, if not actual elimination, within the next few years. It is, therefore, important at this time for teachers to examine very carefully the aims, and the content of their courses, and to consider earnestly whether they are so organizing and teaching the course content as to realize clearly-stated and worthy aims. The lack of standardization in manual arts courses, and the too frequent lack of clearness of purpose on the part of manual-arts teachers, have made this important subject particularly susceptible to attack in the present drive for economy.

Where teachers have a clear vision of the values and possibilities of their work, and are taking full advantage of the great store of educative material to be found in a broadly conceived and carefully organized course, there is small likelihood of their work's being curtailed. Indeed, in the face of almost universal public demands for a decrease in school costs, many places are this year expanding their manual training work. Hence, the problem is not primarily that of making a verbal defense of manual arts in the school but is that of strengthening and enriching the courses. The solution of this problem lies almost wholly in the hands of the teachers. If the shop teachers in the high schools and junior high schools will but realize the present situation, and use all their ingenuity and knowledge to build up their courses, they can make a larger contribution to the development of this work than has been possible during the past ten years.

The illuminating study of objectives[1] in the manual arts work in the grades and junior high schools made by the late Mr. Carman of Columbia University reveals; that while a better understanding of the purpose of such work is had than ever before, still too many schools administrators and teachers do not appreciate the real value and function of this important phase of public education. It is to be feared that too many teachers are thinking still in terms of an obsolete psychology on the one hand, or are insisting on inadequate objectives or objectives of doubtful values on the other. One wonders whether the trouble lies in this, namely, that many of our teachers have not thought through the matter at all and the question of objectives never arises except when some inquisitive investigator asks the direct question, "What is your aim in this course?" Does this not also explain the almost unlimited variety of types of work and arrangements of content? The future of manual arts is in danger chiefly at this point, and therefore some clear thinking on the part of the teachers in regard to aims must soon be done. It appears that it is too often the case that a course is made out and later a statement of aims is formulated to fit the course, if possible. We need more teachers who can first clearly state the objectives they hope to reach, and can then make a course which will contribute definitely to the attainment of those aims.

The young teacher who undertakes to study the various statements of objectives is soon bewildered by the variety, vagueness and multiplicity of aims. The almost interminable lists of objectives which are sometimes submitted as the aims of a teacher frequently become amusing for they contain nearly all of the desirable human attributes, and on their face are impossible of attainment with all of the school subjects combined, and certainly no one subject can be held accountable for their realization. It is necessary then for a teacher to think of the objectives of manual arts work under several heads, first: manual arts must con-

[1]Industrial Arts Magazine, July and October, 1922. Results of an Inquiry Concerning Certain Phases of Junior High School Industrial Arts by Kenneth V. Carman, Columbia University, N. Y.

tribute to the general objectives of public education, such as the development of citizenship, sound social attitudes, character, etc. In the next place there are the *general* objectives or *values* which one may reasonably expect to be attained as a result of well organized and carefully taught shop and drawing courses. Under this head may be: appreciation of the significance of modern industry; a deeper interest in production and skillful work; the development of initiative in situations demanding manipulative skill and technical knowledge; and the development of the constructive tendencies in boys. Many excellent statements of these values have been made. It is important that the teacher carefully think through these general values and be able to defend his opinions. Both these types of objectives belong to the philosophy of industrial education and are fundamental to successful planning and organization of manual arts work. But these are *general* and it is almost impossible at any stated time, in any individual case, to determine whether or not they have been realized, or just to what extent progress has been made toward their realization. Therefore, for the very practical purposes of planning a course of study, buying and arranging equipment, and organizing the details of shop and drawing work, it is necessary to set up very *specific, immediate* aims for that work. These immediate aims may be regarded as means by which we hope to realize the larger and more general objectives.

For example, when one sets up as his objective, a vacation trip, he first states his general objectives; namely, to leave off work for two weeks and go for a vacation; to visit certain interesting places, or to get a much needed rest. Thus far his objectives are very general and are not different from those of most tired busy people who hope to take a vacation soon. He is likely to decide next that he will plan his trip so as to visit Washington and Atlantic City; to travel by easy stages so as not to feel hurried, and to try to meet some old friends while away. These objectives belong to this particular vacation trip but are still general in character. But such a trip will inevitably be a failure unless he works out very carefully the *immediate aims,* such as: "I shall buy my ticket over the Missouri Pacific to St. Louis; I shall change there to the Pennsylvania; I shall spend a day in Washington and see the Capitol, the White House, the Lincoln Memorial; then I shall go to Atlantic City;" and so to the end of the vacation he plans a number of very specific objectives. Before working out the details of a course, it is then necessary to state specific immediate aims which are of such character that the teacher can measure progress and determine at the close of a stated period, whether or not they have been realized. It is suggested then that it is well (1) to think carefully through the general objectives of public education, (2) to formulate the general values to be reasonably expected from a good rich course in the manual arts, then (3) to state clearly a few definite immediate aims of the courses to be given, such aims to contribute definitely toward the realization of the general values and to be such that progress can be measured.

Professional literature is full of discussions of the broader aims of both public education and the manual arts but more discussion of the immediate aims is greatly needed. Let us take here, merely for the purpose of illustration, the statement of objectives in manual arts in junior high schools, which was ranked first in Mr. Carman's study referred to above, namely: "The purpose of the work in these years may be stated as including values for increased practical efficiency and more intelligent citizenship; trying out of vocational guidance values, and values in concrete experiences giving motive for and interest in the subjects related to wider vocational and social interest. * * * To these may be added the specific training values for those who will enter industrial vocations. * * * Here, as in the elementary school, industrial intelligence, insight and appreciation constitute the largest values, and these should not be subordinated to the mere manipulation."

This is obviously a very broad general statement of objectives, which so far as its value as a guide in the planning and organization of work is concerned, is practically worthless. But assuming that this is an acceptable statement of the general aims, what specific aims are to be derived from it for practical use? Eliminating the repetitions of ideas, the objectives are: Vocational guidance, increasing interest in vocational and social life, developing "industrial intelligence," and appreciation of modern economic problems, and for those who are sure to enter industry, definite vocational training. Interpreting these in terms of shopwork we, perhaps, would say "The aims of this shop course are: (1) to give a large amount of information about the typical trades and industries and to give a variety of thought provoking experiences in the processes of the industries represented, (2) for those going into the industrial vocations, to train in the processes of the trades." These two specific aims will be the immediate purposes of the teacher of shopwork in trying to realize the general objectives stated and will determine his course. Thus it is that the shop teacher who would succeed must think through carefully the general objectives of education, the general objectives of his work and from these develop a brief statement of immediate aims of such character that he can measure by examination, or other tests, the progress made toward their realization. So much for the need of a more careful study of both general and immediate aims in the manual arts courses.

Not only is this department of work under fire because of it vagueness of purpose, but also because of the meagerness of its content. It is difficult to persuade a skeptical school official bent on saving money, that the mere making of a certain set of models or projects in the shop is of any great educative value and justifies the relatively large cost of such work. While there is undoubtedly much value in any well taught shopwork which involves correct methods of construc-

tion and design, it is questionable whether the large cost for such work can be justified if it stops with mere construction. And this takes us back again to the question of aims. A further study of various statements of objectives in manual arts work shows a very striking agreement on several important ideas, namely: (1) Manual arts is not specifically vocational in purpose, hence trade skills are of minor importance. (2) Appreciation of the work of the industries as they affect production and community and home activities, is a chief aim. (3) First-hand knowledge of and experience in various tool processes and the methods of handling various important materials of construction, together with other information about occupational life are desirable to aid a boy later to make an intelligent choice of occupation and to develop occupational interests. (4) The manual arts must give opportunity for the development of initiative in dealing with the common problems of construction and the practical situations in life calling for a degree of manual skill and technical knowledge.

If these ideas are acceptable to most teachers as a part of the general objectives of manual arts, then how can we so enrich our courses as to realize them in the shop? Clearly there are two methods of gaining information and experience of the desired kinds in the shop: One by performing intelligently and carefully the manual work of the course, and the other by shop talks, the writing of essays, studying reference books, visiting factories and local construction operations, and by the use of shop and other technical texts. Neither of these methods alone will suffice and the failure of teachers to realize this has endangered their work. In a study recently made by the writer, it was found that in 221 high schools, the median amount of time devoted to class reports, shop talks, essays and references, was 13.7 per cent of the shop time; the percentage of time most often reported was ten per cent of the shop time. Clearly the schools reporting are not giving enough emphasis to the technical and occupational information needed by manual arts students. To reach the ends sought in the statements above, the specific aims would be about as follows: (1) To give a large amout of technical and occupational information relating to typical modern industries; (2) to give as large a variety of experiences as possible in modern industrial processes requiring manual skill and technical information, and (3) to teach the shopwork so as to develop as far as possible initiative and appreciation in the solution of constructional problems. This means that the shopwork must be more varied than it usually is in the small high schools and that *more time must be given to class study.* To illustrate how this may be done, a suggested course outline[2] in carpentry for first or second-year high school boys is given. A similar outline for each of several subjects can easily be worked out if clear immediate aims are before one.

[2]Part of report of Committee on Standard Courses in Manual Arts, High School Conference, University of Illinois, 1922.

**A One-Year Course in Carpentry.**

I. Not less than one-third nor more than one-half of the shop time given to class talks, class discussions and reports on observations, with references and essays, requiring a minimum of two hours per week outside work. Suggested topics:

1. **The manufacture, grading and selection of lumber used in buildings.**
2. **The manufacture and uses of cement.**
3. **The manufacture and uses of brick.**
4. **Names, advantages and uses of the various kinds of brick, and names and uses of different bonds found in common practice.**
5. **Common types of houses with advantages of each.**
6. **Names and uses of different kinds of roofs, and meaning of common architectural terms.**
7. **Names of parts of frame structures.**
8. **Study of structural details of frame buildings.**
9. **Evolution of human shelter.**
10. **Elementary study of bracing, and of wooden trusses.**
11. **Building codes.**
12. **A study of the occupations of carpentry, contracting, architecture, building material salesman, building inspector, concrete worker, electrician.**

**Note: The assistance of local contractors and architects may well be sought in the working out of this part of the course.**

II. Shopwork planned on project basis.

1. A group of projects involving measuring, sawing with hand saws. and nailing with common nails. Suggested projects:

| | |
|---|---|
| **Chicken coops** | **Jumping standards** |
| **Dog-kennels** | **Bicycle racks** |
| **Rabbit hutches** | **Shipping crates** |
| **Stilts** | **Benches** |
| **Sleds** | |

2. A group of projects calling for hand planed boards and jointed edges, using finishing nails. Suggested projects:

| | |
|---|---|
| **Nail and tool boxes** | **Cases for camping trips** |
| **Tool chests** | **Door and window frames** |

3. A group of projects involving problems of bracing and use of framing square. Suggested projects:

| | |
|---|---|
| **Brackets** | **Roof trusses** |
| **Barn or garage doors** | **Small foot bridge** |
| **Gates** | **Playground equipment.** |

4. A group of full-scale building details. Suggested projects:

**Corner of house, floor and ceiling.**
**Cornice detail.**
**Portion of wall with opening, window or door.**

5. A building project as of a complete hip roof, or small one-room house, using shortened dimensions but full-scale material. If possible an out-of-door building project should be used.

One or more reference texts should be used with shop courses. Suggested texts:

**Agricultural Woodwork: Louis M. Roehl.**
**Carpentry: Griffith.**
**Shop Projects Based on Community Problems: Burton.**
**Problems in Farm Woodwork: Blackburn.**
**Constructive Carpentry: King.**
**Farm Shopwork: Brace and Wayne.**

To get the maximum value from such a course the teacher should spend much time in careful planning and preparation. He first of all must familiarize himself through study with all the subjects to be handled in his outline, and then he must see to it that available material such as reference books and technical magazines are easily accessible to the pupils. Where library facilities

are inadequate, the school itself, as part of its manual arts equipment should purchase the material. Technical books and magazines should be considered as necessary a part of shop equipment as work benches. If the school board is reluctant to spend money for such materials either gifts of public-spirited citizens, or the contributions of interested students, can be relied upon. Where the teacher fully realizes the importance of this work, little difficulty will be experienced in obtaining the necessary books and periodicals. In this connection, too, full advantage should be taken of the vast amount of valuable advertising material, available from the many commercial houses serving the needs of school shops. In the professional magazines are to be found many advertised offers of free material most of which is of great value to a resourceful teacher.

In using the study topics suggested, a variety of methods may be employed. For a subject such as number one, above, "The manufacture, grading and selection of lumber used in buildings," perhaps the best treatment is to give a very brief talk on the subject, indicating sources of information, and then assign the topic as the subject of an essay. While for number five, "Common types of houses with advantages of each," perhaps the best treatment is to carry out a carefully planned developmental lesson or class discussion. The initiative and ingenuity of the teacher is constantly challenged by such a course and he will be delighted often to discover that his own growth in technical knowledge and in professional interest is greatly advanced.

The type of shopwork suggested should be characterized by careful planning and flexibility. Correctly made drawings should be used exclusively, and as soon as students have progressed far enough in their drawing course they should work, as far as practicable, from their own drawings. Sound principles of construction and *good design* should always be kept clearly before the pupil's mind by constant suggestion from the teacher.

The development of courses filled with interesting projects, which are well designed and require initiative and thoughtful planning on the part of the pupils, and are, in addition, rich in technical and occupational information will do more to assure the permanence and growth of the subject than any sort of arguments can accomplish. Such courses are not likely to be denied support and recognition. It seems very clear then that the future of manual arts is in the hands of the teachers. It is imperative that they have clear aims and that they be willing to give the necessary out-of-school time to hard study and careful planning. When this is done, the courses taught by such teachers will be rich in meaning, in interest and in educative value.

# First Year Machine Science in Vocational Schools

**James Forbes, Director, Southbridge Vocational School, Southbridge, Mass.**

THE question as to what constitutes science in the trade school has been a much discussed one. In schools where any attempt has been made to teach the subject, it has usually resolved itself into a course in general science which undoubtedly is very desirable, provided there is sufficient time to devote to it.

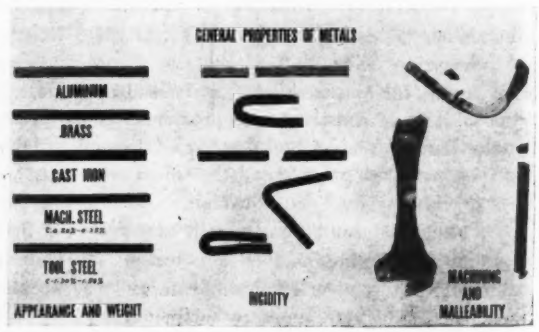
For the past few years, the writer has been engaged in the development of a course in specialized machine science for boys attending trade schools, whose time in school is limited to periods of from two to three years.

That the teaching of science to a pupil is largely a matter of environment, and that it ought to center itself around the things which the boy comes in daily contact with is an un-disputed fact. Hence, in the development of this specialized machine science, careful attention is given to the desirability of utilizing so far as possible, the ordinary shop tools and equipment with which the pupil is familiar.

As modern methods of production depend upon the application of scientific principles, the machine shop of today affords an unlimited field to the teacher from which to draw his material. The problem then becomes one of selecting the subjects which bear directly on the trade in order that the boy may leave school with the best possible equipment.

The term science as applied to this course is really a combination of materials of trade, elementary mechanics and physics. It is arranged in such a way as to enable the boy learning to be a machinist, to grasp most of the elementary scientific principles connected with his trade, without the necessity of his going through a long course in the different branches of science.

For example, the boy entering the shop comes in contact with materials used in building the various




PHOTOGRAPH OF A COLLECTION OF METAL BARS TO ILLUSTRATE THE GENERAL PROPERTIES OF METALS.

parts of the machine he operates, materials upon which he performs work. While he may not in a general way, be entirely ignorant of these metals, he is not familiar with their more common properties and has no idea as to why a certain metal is used in one part and a different metal in another. As a beginning then, we let the pupil take bars of the most common metals used in the shop, become familiar with their appearance so that he may readily recognize them; weigh them and investigate the difference in their weight; hammer them in a vise and see if they bend or break; chip the bars and file them, and get an idea of how hard or easy they are to cut; heat them and attempt to forge, and finally tabulate the results of this work on a data sheet. From the results of such an investigation certain very definite facts will have become firmly established in the pupil's mind. While they may be elementary enough in a way, nevertheless, they have placed some valuable information in the hands of the beginner regarding, (a) The strength properties of the various metals, (b) The working properties of these metals.

With this work as a foundation, it becomes a comparatively easy matter for the pupil to see why aluminum is used where lightness is required, cast iron where stiffness is desirable and steel where toughness is necessary. He will also learn that one metal cuts easier than another. Consequently he will approach the subject of cutting speeds knowing that the variation is due to the difference in resistance offered to machining by the various metals.

The fact that he has actually heated and tried to forge these metals will have definitely fixed in his mind which of the metals can be forged into shape. From this he will see why some of the parts he machines in the shop come through in the shape of forgings, while others come to him in the shape of castings.

The next logical step in the development of the course has to do with cutting tools. This brings up the question of the hardness of metals before and after heat treatment, and is intended to familiarize the boy with the operations of "hardening," "tempering" and "annealing." It becomes apparent at once to the pupil after heat treating the various methods, that cast iron is not suitable for use as a cutting agent; that machine steel does not appreciably get any harder after heating and quenching; and that tool steel becomes glass hard, with the result that in the next operation, the pupil is led up to the question of tempering and finally to that of annealing.

While the file method for testing comparative hardness gives a fairly good approximation, the use of a scleroscope is better. It is also true that, while very good results may be obtained by using the color scheme with the open forge for hardening, tempering and annealing, still the use of a furnace equipped with a pyrometer is preferable to that of the open forge. Whenever possible the use of both methods is recommended.

MOLDING OUTFIT TO ILLUSTRATE OPERATIONS OF MAKING MOLDS AND CASTING METALS.

After having completed the work the pupil will possess at least an elementary working knowledge of the heat treatment of metals, and certain shop terms, such as scale on a metal, hardening, tempering and annealing will have become clarified.

The question of temperature will mean something definite. The carbon content of steel from the standpoint of its ability to harden will be understood and the necessity for accurate scientific measurement in the heat treatment of metals will have become impressed on the mind of the student.

The dependence of the machine shop for its castings upon the foundry, and its forgings upon the blacksmith shop or drop forge plant, makes it highly desirable for the student to have some knowledge of these processes and to be familiar with the terms used.

Hence, it seems advisable that the next unit in the course have to do with these two methods of the forming of metal. Consequently molding and drop forging

are treated in such a way as to make these two processes clear to the pupil.

In the machine shop and drafting room, the boy is constantly running across such expressions as coring, shrinkage, finish, draft, flash on a forging and a multitude of other terms which mean nothing to him. Even if they are explained by the instructor as occasion arises, they represent very little to the average boy, whose trade knowledge is acquired more by "doing" than by "telling." Consequently, means are provided in the course for an opportunity to make a casting and a drop forging, using lead as the metal on account of its low melting point and its ease of forming into shape.

In the molding experiment, the regular molders' equipment is used consisting of the flash, green sand, rammers, etc. Molds are made from wooden patterns, which are afterwards poured from lead, of a flat block, a cored bushing, and a small pulley which are sufficient to answer most of the requirements.

For the work in drop forging, a small drop hammer has been designed and made so that a forging could be formed out of lead. Most of the principles involved in this process such as the use of dies, the flash and necessity for trimming the forging are made clear.

The pupil has now acquired some definite information regarding molding and forging. If this work is followed up by a visit to a foundry or drop forge plant where the work is being done upon a commercial scale, he will have learned in a short time, what otherwise might have taken years to absorb.

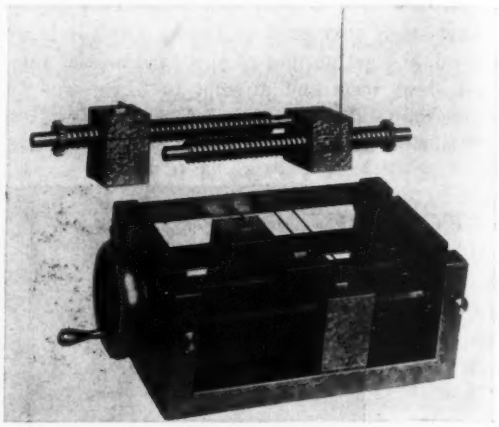
The pupil has now reached the point where a knowledge of the effects of friction in different types of bearing surfaces and the value of lubricant in reducing the heat generated by friction becomes essential. This is accomplished by using a surface plate and blocks of the common bearing metals, which are used to show the difference in effort required to move one surface over another when "dry" and when "lubricated."

The difference in effort required to move a flat bearing, a ball bearing and a roller bearing are then demonstrated by mounting a load on each of these types, and the subject of bearings is thus made clear to the pupil.

How heat is generated between bearing surfaces is first demonstrated by running two disks of cast iron together in a lathe, and noting the temperature rise when running dry and when lubricated. This is afterwards studied for the diffierent bearing metals by noting the temperature rise in a machine specially designed for this purpose, running under different bearing loads, and at different rates of speed. If this work is followed by a simple experiment dealing with the effect of heat on the expansion of metals, the pupil will gain some elementary practical ideas about friction which cannot help but be an aid to him in his shopwork.

The subject of gearing comes next in order. By means of suitable equipment, the advantages of toothed gearing over friction wheels in the ordinary transmission of power is demonstrated, the pitch circle and gear tooth forms are shown with a piece of apparatus consisting of a pair of friction wheels, each wheel carrying segments of a spur gear which mesh together and thus form a combination of friction and toothed gearing.

Trains of gears are arranged on a sliding plate and the velocity ratios of simple and compound gear trains are investigated. Finally the power transmitted



MACHINE FOR DEMONSTRATING LEAD AND PITCH OF SCREW THREADS.

through different sizes and combinations of gears are measured in a machine constructed for this purpose. It is to be understood, of course, that these experiments are of a very simple nature. While they call for a certain degree of scientific intelligence in obtaining and interpreting the data, they are not intended to present a mathematical treatment of the subject which would be away beyond the capacity of the pupil.

A great deal of confusion regarding threads and the meaning of such terms as "pitch" and "lead" arises in the mind of the beginner, hence the next unit in the course has to do with Screw Thread. The use of a small machine carrying three screws—one single, one double and one triple thread of the same pitch, with the nuts so arranged that the lead of the screws may be measured on a scale provided for this purpose—serves to illustrate the difference between pitch and lead, distance travelled by a nut in a certain number of terms and leads up to a consideration of the thread angle of various threads both single and multiple. This is accomplished by the use of a piece of apparatus, carrying a split roll, so designed as to be capable of tracing the thread outline on paper with a pencil and thereafter laying-out the sheet so that the thread development is readily seen and understood.

The use of cams in machinery is shown. By a specially designed machine and linear development and method of obtaining different cam motions are demonstrated so that the pupil will be able to lay out cams for any particular purpose either in the shops or drafting rooms.

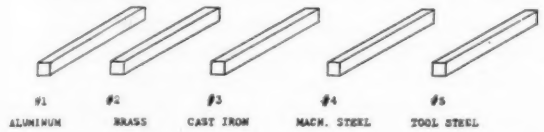
The concluding unit in the first year's work consists of a few experiments on the simpler mechanical movements together with elementary mechanics of the lever, inclined plane, etc. The more advanced work on strength of materials, and efficiency of machines, is left for the second year's work.

**MACHINE SCIENCE.**

**"Properties of Metal"**

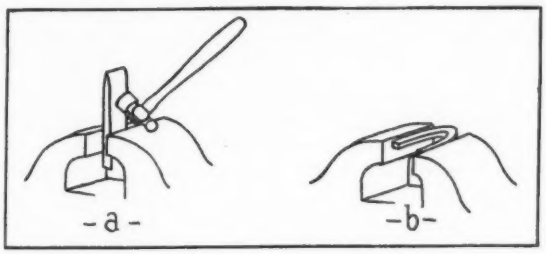
**Instruction Sheet** **Experiment No. 1.**

A. COLOR AND APPEARANCE. Examine each metal in the series and name its color and outward appearance.




B. WEIGHT. Weigh each bar accurately. Using the lightest metal as a base, with value 1, arrange the series according to weight, giving relative number values.

C. RIGIDITY. Place each bar in a vise vertically, with the jaws gripping 1½" of the bar.
Using three methods:
1. One hammer blow.
2. A series of hammer blows.
3. Squeezing in the vise when bent.




Find out:
1. What metals, if any, bend and take a "permanent set?"
2. What metals, if any, bend and spring back into shape?

Note the approximate angle each metal bends before breaking.

D. RESISTANCE TO CUTTING. Use a hammer and chisel, then a file. Find out how readily each metal may be chipped and filed. Machine each metal and give the formation of the chip as under:
(a) Long and curly.
(b) Short and bent.
(c) Crumbly.
What relation, if any, has the formation of the chip to the strength properties of each metal?

E. MALLEABILITY.
1. When cold. Place each bar on the anvil and try to forge it; what metals are malleable when cold?
2. When hot. Place each metal in the forge and heat it. Using hammer and anvil try forging; which metals are malleable when hot?

Investigate the heat at which the metals forge easiest without cracking or crumbling, as under:
(a) Low heat;
(b) Medium heat;
(c) High heat.

Reference Books—Machinery's Handbook; Machinery's Reference Series No. 36, "Iron and Steel."

**MACHINE SCIENCE.**

**Properties of Metals.**

**Questions.** **Experiment No. 1**

1. What is specific gravity? A bar of aluminum weighs 10 lbs. What is the weight of similar bars of Brass, Cast iron and Tool steel? (See machinery's Handbook P. 1247).
2. State what metal you would use in the construction of (a) Base for Milling Machine; (b) Main line shaft; (c) Bearing for pump; (d) Crank-case for automobile; (e) Lathe spindle.
   Give reasons in general terms for your selection.
3. Tabulate the materials used in the construction of the various parts of an upright drill press.
4. Which metal did you find the easiest to file: Machine Steel or Tool Steel? Arrange the following metals in the order of their ease to machine: Yellow Brass, Aluminum, Tool Steel, Cast Iron and Machine Steel.
5. Give the approximate cutting speeds for machining the following metals: Soft steel, medium steel, hard steel and gray Cast iron. (See Machinery's Handbook p.p. 795-796.)
6. What conclusions would you draw regarding the strength properties of a metal, from the formation of the chip as under:
   (a) Long curly chip.
   (b) Short bent chip.
   (c) Crumbly chip.
7. State definitely what happens when you heat a piece of (a) Composition; (b) Cast Iron; (c) Machine Steel; (d) Tool Steel at different heats and tried to forge them.

Machinery's Handbook.
Machinery's Reference Series No. 36, "Iron and Steel."

# Teaching English with the Aid of Manual Arts

**Mrs. Blanche G. Williams, Indianapolis, Ind.**

IN the up-to-date school of the present, children are doing things; they are working out their own destinies with the safe and sane guidance of teachers. The "pouring in" process is relegated to ages past and the day of the child at work at his own problem—self-initiated and self propelled—is at hand. What is a child's problem? Take just one, the problem of learning to use the English language freely and fluently.

Children left in their own world and their natural environment will find much that is interesting and vital to them; they are given opportunity to give expression to just this through the use of an individual project method. They choose a subject for an entire semester. While the principal object in view is an oral or written language expression, consecutive interest in the same field gives rise to various means of clarification, thus opening up a broad experience that touches life itself. One child chose "food" for her subject for the semester, selecting for one oral talk and one written article, a suitable breakfast for children of her own age and habits. This she prepared at home, and with the aid of the domestic science department, presented it before the class to demonstrate her work in oral English. It was neatly arranged upon a tray over which was a

white linen tray cloth. The dishes too were in good taste. This was the breakfast she had prepared.

½ orange
1 cup cocoa (made with milk)
1 slice toast
1 dish cream of wheat
½ cup whole milk
½ ounce butter
1 egg (large)

She began her talk by discussing food values, analyzing in particular those upon the tray. From that topic she proceeded to the question of calories. She had previously studied out her calorie scale for nourishing foods for children which she had placed upon the board and to which she now referred. Her next step gave some idea of the calories needed by persons variously engaged—the number required per day, per week, etc. This was her calorie scale:

Milk
Whole ¾ glass
Skim 1⅓ (½ pint)
Cream ¼ cup
Butter ½ ounce
Cereals
Corn flakes 10 h.T
Cream of wheat 4 h.T
Grape nuts 2 h.T
Hominy 3 h.T
Eggs
Boiled (large)
Vegetables
Potato (1 average)
Spinach 4 h.T
Beans (baked) 1 h.T
Beans (string) 10 h.T
Carrots 4 h.T
Cabbage 60 h.T
Corn 2 h.T
Beets 6 h.T
Lettuce 2 heads
Celery 1 bunch
Tomatoes 12 h.T
Peas 4 h.T
Onions 4 h.T
Turnips 6 h.T
Fruits
Apple 1 large
Orange 1 large
Lemon 1 large
Grape fruit ½
Canteloupe ½
Pear 1 large
Pine apple 2 slices
Peach 3 average
Banana 1 large
Bread
White slices ½" thick
Graham 2 slices ¼" thick
Biscuit 1 average
Corn bread 2"x2"x1" piece
Muffin ¾
Crackers
Graham 2
Soda, butter 4
Saltines 6
Desserts
Sponge cake 2 by 2 by 1
Gingerbread 2 by 2 by 1
Cookies 2 (2½ inches in diameter)
Puddings
Bread 1 h.T
Custard 2 h.T
Rice 2 h.T
Tapioca 2 h.T
Beverages
Cocoa (made with milk ½ cup)
Meats
Bacon 4-5 slices
Ham I ounce
Roast chicken 2 oz.
Round steak 2 oz.
Roast lamb 2 oz.
Broiled halibut 3 oz.
Tenderloin 1 oz.
Salt pork 1 in. square
Oysters 12

She then applied the breakfast she had prepared to the calorie scale which was summed up in this manner:

| | |
|---|---|
| ½ orange | 100 Calories |
| 1 cup cocoa | 200 Calories |
| 1 slice toast | 50 Calories |
| ½ cup whole milk (ap.) | 35 Calories |
| ½ oz. butter | 100 Calories |
| 4 T cream of wheat | 100 Calories |
| 1 egg | 100 Calories |
| Total | 685 Calories |

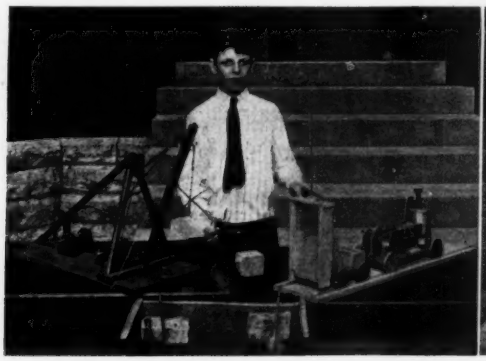
She then drew the conclusion that this breakfast measured up as to food value and food units, considering the other menus of the day which would be taken up at another lesson.

Boys are most apt at getting into the midst of things in life outside and bring a wealth of material into work of this kind; not only that, through it they often render real civic service as was the case with this boy who chose for his special subject "fire prevention."

On a particular week he took for his article and talk "Sending in a Fire Alarm." Previous to the recitation he had made a careful study of the fire alarm box at the corner; he took measurements and constructed the outside box in wood so accurately that when the fire company lent him the actual mechanism within the box, it fitted perfectly.

The boy would never have gained access to an alarm system of this kind if he had not previously established a friendship among the firemen which gave them the utmost confidence in the boy. The members of the class called it a "$150 recitation" because the alarm box cost the city $150, but the principal saw in it a value that couldn't be estimated in dollars and cents. There was value in the explanation he gave as to the manner of sending in an alarm, as well as the exposition he gave as to the working of the machinery. The greatest value and that most worth-while to his class and the remainder of the seven hundred children, who attended his school was that this fire alarm box was a great protection to life and property; that it was right that every individual should know how to send in an alarm; that on the other hand, it was a very grave matter to send in a false alarm and cost the city $50 every time a wrong of this kind was committed.

It is very interesting to see where they go about their community, what they find there, and what they are able to bring in. It is interesting to see a class wending its way to the classroom on the day they are to



PRODUCTS OF THE MANUAL TRAINING SHOP WHICH ILLUSTRATE THE TRANSMISSION OF POWER.

A NATURE STUDY COLLECTION.

give their illustrated talks. They may carry anything from an automobile tire to a delicate piece of needlework; or from the side of a miniature house, with laths, plaster, carpenter's tools, plasterer's tools, to the dantiest of cakes or the lightest of rolls. A boy may bring something which has taken hours or weeks to construct; he may bring something as simple as a piece of tar. He may have worked on a drawing that took weeks to prepare to his satisfaction whether in the form of a chart, a map, a working drawing, a blue print, a poster, a story picture, a piece of scenery for a stage. On the other hand it may be as simple as a lantern signal used along the railroad that runs through his district.

When a need arises they meet it when it is their own problem and they understand the responsibility in its solution is their own. One boy having "poultry" for his subject needed an incubator in his business of demonstration. He saw one in a feed store window. He found a way to get it to his classroom. Several steps were necessary to have accomplished just that. He attended a poultry show where he not only saw much to report upon but acquired much printed matter on the subject that he considered valuable; he entered into correspondence with many firms that mailed him catalogs; he found much material in magazines. He thus had such an accumulation of literature on his subject that he had to spend one week making a filing cabinet for the purpose. This became the basis of his talk for that particular week.

The girl who chose "a milk supply for a city" visited a pasteurizing plant and gained enough information to put a part of her knowledge into practical use; she made a real pasteurizing device for use in the home. The girl who took "the care of little children" visited a free kindergarten and a primary school in order to get

A SEWING EXHIBIT.

THE REPAIR OF TIRES.

ideas. Thus the work swings on—purpose-giving impetus.

A selection of a class in these community project English subjects may prove of interest: Fire department, city water supply, garbage disposal, city railroad, the school paper, the school play, art, cartooning, poultry, pigeons, rabbits, carpentry, architecture, interior decorating, exterior decorating, plastering, cement work, electricity, tire repair, automobiles, glove factory, hosiery factory, department store, the florist home gardening, landscape gardening, raising flowers, candy factory, furniture factory, envelope factory, the stage, the moving picture, good roads, traffic rules, paving, hard wood floors, publicity work, interurban locomotives, telephone, telegraph, milling, lumber mill, veneer works, electric signs, millinery, nursing, health, city market, care of the house, care of the hair, canning, modern devices for the home, tailoring, moulding, city newspaper, tree surgery.

These pictures visualize the work giving some conception of the manner in which the child gives expression to his thinking in this chosen field.

## VALUE OF CRAFTSMANSHIP.

If the wealth of a nation depends upon its proportion of skilled craftsmen, then the respect for craftsmanship which bookbinding engenders is worth cultivating. In every direction today there is need of craftsmanship. If we as teachers are sincere in deploring that our education is too bookish, we should at least develop to its utmost the only form of handwork within the reach of many of us. For behind craftsmanship lies character. "All youths of whatever rank," said Ruskin, "ought to learn some manual trade thoroughly; for it is quite wonderful how much a man's views of life are cleared by the attainment of the capacity of doing any one thing well with his hands and arms."—*The Teachers' World*, London.

# Teaching Technique in Printing

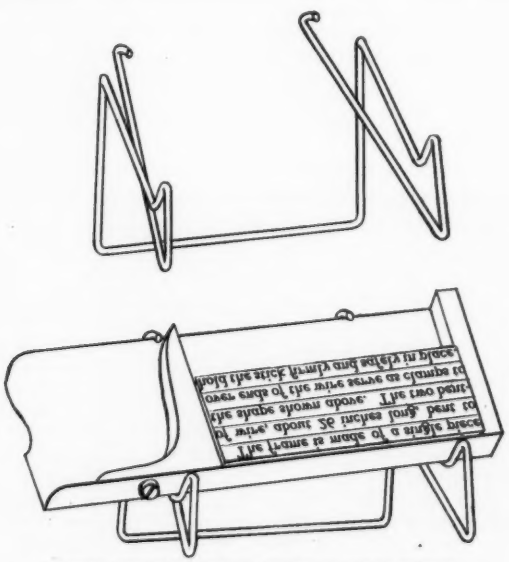
**Frederick Ames Coates, Continuation School, Worcester, Mass.**

PRINTING as taught in public schools may be variously considered as a handicraft, an art, a stimulant to other work, a direct aid to English, an introduction to industry, or a trade. No two schools of different type—perhaps no two instructors in schools of similar type—must of necessity hold the same view as to the purpose of their teaching.

But in the minds of those connected with it either as employers or workers, printing is first and foremost a trade. Whatever the immediate purpose of our school instruction in the subject, we can not get away from the fact that printing is a trade; we can neither avoid nor deny some degree of connection with the industry.

A trade is not a mere occupation; the word implies something more: a certain amount of skill, of technique. This technique does not consist merely of manual dexterity, of muscular reflexes. If I may be allowed to define it for our purpose, technique is a unified collection of correct habits applicable to a definite end; of habits mental as well as purely manual. No habit is of overnight growth; and it may well be questioned whether a course of school instruction, necessarily brief as it is, can impart a sufficient body of correct habits to the learner in any trade, particularly in such a trade as printing. But we can and should at least see, that as far as we go, we do not suffer any incorrect habits to be formed.

To this extent then we can teach the technique of printing. In no school would it be maintained that the printed product of the shop is more than a subsidiary consideration. Methods of workmanship should in every case be considered of primary importance. Yet the writer has noted instances in which these have been slighted, frequently through a weak yielding to the pupils' impatient desire to "print something." A few of these danger points are mentioned below.



A HOME MADE WIRE HOLDER FOR TYPE STICKS.

The method of holding the composing stick is one which has remained unchanged through centuries of printing, and which is the only correct way both by reason of the construction of the stick itself, and because experience has proved its efficiency. Printing has not waited for motion-picture study of its operations to disclose to its craftsmen the most economical and rapid ways of doing things. Indeed, the recent work of so-called "efficiency experts" is nothing more than an attempt to apply to semi-skilled labor the foundations of a technique, approximating that which all true trades have already developed for themselves long ago. A boy once defended himself to me for holding the stick in his right hand, with the plea that he was left-handed. But printing sticks were not made for left handed people, any more than house doors were made for men seven feet tall. There was a fine illustration of the need for individual adjustment to fixed conditions. With normal boys certainly there is no excuse whatever for the various methods of holding the stick, some of them ludicrous in their awkwardnss which may be seen at times in almost every school printing shop. There is but one right way; no other should be tolerated.

The desire to see the type letters "right side up" is probably responsible for a great deal of this. For some perverse and unknown reason, the average boy seems to think this a paramount consideration to read ing and setting the type from left to right, in the natural way. As soon as I discovered this tendency in my classes, I constructed a holder which would support a stick filled with type in about the position that it should be held in the hand; and I required frequent practice in reading the type in the right way. I thus finally made it easier for every pupil to read type in the right way than any other; which is as it should be. It may be objected that by so doing I was making them devote some of their shop time to non-productive effort. I may say, however, that the saving in "pied" lines through holding the stick incorrectly, and later in speed of composition due to the ability to follow the composed matter without contortions, more than compensated for the time spent in the acquisition of this bit of correct technique.

Yet I have seen a printing instructor allow pupils, in "setting up" a case to clean it, stand the types with their nicks downwards! Much admonition would fail to counteract the bad effect of this practice.

I once walked in upon a printing instructor "after hours" to find him respacing and justifying every line of a page which had been set by his boys. "Rush job," he apologized. "Some commercial work I've got to get out for the school authorities."

That explanation would have been ample—for "rush commercial jobs" *do* happen in the best-regulated schools—if this instructor had been *setting* the type himself. The point I wish to make is that in permitting the boys to compose the words but to neglect their spacing and justification, he was giving tacit encouragement to a misconception altogether too prevalent among pupils: the idea that the one process is more important than the other. In no real printing shop is this true. A compositor whose lines require re-justification by the stoneman or anyone else, or whose proofs are too frequently marked for poor spacing, is due for a long—long journey from the shop which he has been blessing with his efforts. No eye for art or tasty arrangement, no fine sense of type-face values can save him.

Nor is there any salvation for the compositor who "breaks" his stick to empty it. Not only is it a slovenly method, extremely apt to pi the ends of the lines; not only is there constant danger that the stick when re-set will not perfectly correspond to the original measure; not only does it do away with that valuable test of the perfect justification of lines which correct emptying of the stick involves, but it is actually far more difficult than emptying the stick properly. It cannot be gainsaid that there is a high degree of technique in emptying a stick of type: the precisely correct way of holding the thumbs and fingers of both hands, the delicately exact pressure on the ends, cannot be acquired without practice. But that practice cannot be had without trying; and the time to begin trying is the very first time a stick has to be emptied. In my experience, the average boy will pi not more than three stickfuls before succeeding in emptying one intact. After that, his pride of achievement will induce him to use the right method. Before that—well, I have made it a practice to stand over each pupil at the crucial moment, to see that he did not try to improve upon the method used by Gutenberg's successors for over four hundred years.

The tying of type on the galley is by no means so difficult a feat; yet there is a definite technique in it. I once knew a self-made printer—one who developed from a toy hand press to an actual one-man commercial shop—who used to tie the two ends of his page-cord together in a bow-knot. At last an itinerant printer who "picked up" a few days' work with him instructed him in the method of tucking the loose end of the string in a loop at the corner. I do not know that our printer ever pied many jobs by his extremely individual ties; nor that the time he wasted in making them was translatable into dollars and cents. I only know that once he was familiar with the standard practice in this respect, he always used it.

Tweezers are found in every printing office. Their purpose is to make stone or press corrections. Sometimes a good printer will use them on type in the galley—but he knows what he is doing. I struggled with them for two years, and finally abolished them utterly from my school printing shop. The large quantity of type that went into the "hell-box" with scratched and ruined face was by no means my chief reason for so doing. Corrections except of battered or inverted letters usually involve a change in the length of the line. The only proper way to correct a line is to lift it by the ends—the fingers being the only tools—to insert it in the stick, and make the correction there. It is not even a slow method, once facility has been acquired. I finally enforced it by making tweezers taboo.

It is not within the scope of this article to mention every point of technique even in the simplest of the printer's operations. The handling and feeding of paper—even with hands not immaculate—without leaving a smear; the securing of accurate register; the careful watching of the inking; these and many other things will readily suggest themselves. No operation is too simple to have its proper technique. On the other hand, there are some refinements of skill, such as the movement of the stick-holding hand parallel with the right hand in setting type. This may be emphasized or not, according to the judgment of the instructor, taking into consideration the purpose of his instruction and the time he has with each pupil.

It will be noted that none of the matters mentioned here depend at all upon the elaborateness of the equipment. Nor are these essentials at all contingent upon whether the pupil has two hours of printing a week, as in a manual-training shop, or several hours every day. Wherever printing is taught at all, the essentials of technique can be and ought to be the first consideration. After them—production, art, or whatever you will.

The truth is that even from the smallest manual-training subsidiary shop there is always the possibility that a boy will drift into printing. And if he does, he is almost certain to tell of his school experience. It matters not to the employer that the production of printers was as far from your aim as north pole from south; if he sees slovenly or positively wrong methods, he is likely to acquire an unreasoning prejudice against all school instruction in printing. Employers in the industry whom I have interviewed have been unanimous on one point at any rate: they do not expect the entering apprentice, whether he be from a printing school or not, to know much; but they do expect and desire that whatever he does know shall be correct.

But leaving the possible employer out of the question, what value is there in manual training greater than the acquisition of dexterously efficient skill? What introduction to the world of industry is of value which leaves out the importance of technique? Of what good is trade preparation, however broad, whatever expensive machinery is used, which is so superficial as to leave the simplest elements of the trade's operations unattained?

The teaching of technique will not merely make it unnecessary for us to apologize for our instruction; it is in itself an end so valuable, that even the thoughtless pupil will realize that his growing individual skill is a far more important product than the most "showy" job turned out of the shop.

# Paint Shop Rubbing Practice

Ralph G. Waring, Syracuse, N. Y.

WHEN the subject of paint shop rubbing practice is brought up for discussion, one is amazed at the complexity of methods and materials employed.

In spite of many fads and fancies developed in recent years, a few standard practises stand out and persist in spite of all efforts at short cuts. Often, of late years, and especially since the war, the question has come up in the factories as to whether or not it is necessary to sand or rub varnish materials between coats. Cannot several coats be applied one over the other, with no treatment other than drying, simply rubbing the final coat to a surface? The same idea occurred to me some seven years ago, and I immediately began a technical study with standard high grade materials from several manufacturers. Briefly the results obtained showed that varnish coats have such very high gloss and therefore slippery surfaces, that succeeding coats have little or no affinity for each other with consequent flaking and generally severe checking as the apparently inevitable result. Furthermore it appeared that those panels which were sandpapered, or water rubbed, were very permanent, very transparent, and much richer in general appearance, due to the plate glass levelling effect produced by the rubbing process. It was further evident that the sanding or rubbing produced enough microscopic abrasion to offer a firm foothold for different coats of varnish. When oil rubbing between coats was practiced, however, softening of the film was produced, together with bad checking and flaking, accompanied by loss of gloss and transparency. Last of all, it was quite apparent that it was impossible to rub the last of three coats of varnish to a true surface without "sweating" or "rubbing through" in spots due to fine inequalities in the wood itself, left even after the most careful sanding.

In view of this past series of tests, as well as observation of the goods of manufacturers placed in the sales rooms, I am more convinced than ever that following methods here outlined will continue to be sane and practical for some years to come.

No varnish surface will ever develop its full beauty of transparency, magnification and color, unless it be absolutely level and true in all portions. A film showing sags, waves, pinholes, or brush marks has little to recommend it; all its imperfections distract the eye to the hurt of its good qualities. Long observation has shown me that the first coat of varnish is the real foundation for the production of a true finish; neglect on the priming coat has its imperfections enlarged and magnified with succeeding coats; so that it is imperative that each coat receive its proper share of treatment. For example, in piano factories, it is standard practice to sand the first coat of rubbing stock with a split 6-0 paper; the second with 10-0; the third is rubbed with F pumice stone, felt pad and water; the fourth with FF pumice stone, felt pad and water. A coat of piano polishing varnish is then flowed on under such ideal conditions that it is absolutely free from all imperfections and is often left "in the gloss" untouched. With the more expensive cases, however, this last coat will be water rubbed with FF pumice stone and felt pad, and then washed off to be set aside for twelve hours before being polished with water, rotten stone and a soft and fine felt. In the case of drop fronts and panels of great beauty the rotten stone will not be washed off, but will be "handed off" by rubbing dry with the palm of the hand until all rotten stone is entirely removed, thereby producing the very finest polished work yet known.

This practise may be approximated however by following this specification:

1. Sponge the work to raise the grain and lift up any bruises.

2. Sand to a glass smooth surface, especially all end grain.

3. Stain with a properly compounded *water* stain. Do not sand.

4. Size with a tinted shellac; cut 1½ to 2 pounds of gum per gallon.

5. Sand with a split 5-0 paper, garnet preferred.

6. Brush on a coat of Pratt & Lambert's No. 61 varnish, dry three days at 75° F.

7. Sand free and clean from nibs and other imperfections.

8. Varnish on a full bodied coat of No. 61 varnish. Dry three days.

9. Rub out carefully with F pumice stone flour, hard felt pad and water. Wash off and dry five hours at 75-80° F.

10. Varnish on a full bodied coat of No. 61. Dry five days at 75° F.

11. Rub out with FF pumice flour, felt pad and water using a 1″ soft felt on all beads, turnings, etc., and a 1″ stiff bristle rubbing brush on carvings. For a medium gloss, high-grade finish, this is sufficient; after cleaning up with a good polish.

If however, a piano polish is desired, set the work aside for twelve hours, after rubbing in pumice stone, to allow the surface to reharden. Use a fresh, soft felt pad with sifted rotten stone dusted over a well watered surface and rub "with the grain" thoroughly and completely until the work is entirely polished. Much practise and experience alone will teach the operator when to stop rubbing operations.

The above procedure will produce very high grade results in the hands of experienced operators and when properly done cannot be told from five and six coat work except by one technically trained.

These, then are the general specifications for producing high grade results. They can, of course, be modified to suit local conditions as well as the value of the finished product. It is obviously out of place to apply an expensive high grade finish to a poorly made piece of furniture. Let us now, therefore consider these specifications in detail.

The work of sponging, sanding, sizing and sanding with split paper on the undercoats has been previously discussed.

Reference to Plate 1 will illustrate the usual and practical method of handling split sandpaper when sanding varnish. Notice that the four finger tips form a pad with which to back up the paper clamped in place

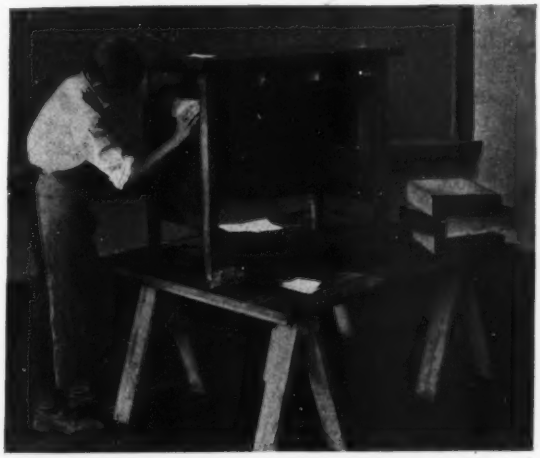


PLATE I. SANDING THE VARNISH COAT WITH A SPLIT 5-0 GARNET PAPER. NOTE DAMP SPONGE AND ANGLE OF LIGHT.

with the thumb. A damp sponge should be placed in a handy position in order that the fingers may be frequently moistened to stop slipping. The insanitary method of spitting on the paper side of the paper to prevent slipping, as practised in many shops, should not be tolerated.

In sanding panel ends, start as shown in the plate by sanding across the grain at the top and bottom of the panel. The entire panel should now be sanded "with the grain," and all cross scratches are then removed. The work should be sanded to a point whereby all gloss is removed and a true even surface produced. The piece should be carefully dusted off before taking to the varnish room, where it should then be cleaned with a tacky cloth as suggested in the previous article. After varnishing again great care should be exercised to "pick" the varnish in order to lessen the work of rubbing.

Essentially the operation of rubbing consists in washing the surface with a sponge so as to leave plenty

PLATE II. CROSS RUBBING END GRAIN WITH THE FELT PAD, PUMICE STONE FLOUR, AND WATER.

of free water over which the pumice flour is sifted from a sugar sifter, which may be secured in aluminum for ten cents in most Woolworth stores. This is a great aid in keeping the pumice stone clean and free from other grit contamination; undue waste; as well as affording a means of quick and even distribution over the surface to be rubbed. Do not attempt water rubbing in any dainty, ladylike manner. The work cannot be done properly unless the water and pumice stone is of a sloppy consistency for which reason most "rubbers" wear rubber, or waterproofed aprons. In shops where the work is on a piece-work production basis, soft wood gratings are provided to permit the slop and drip from the rubbing operations to drain off into catch basins.

PLATE III. RUBBING WITH THE GRAIN, USING A LONG, FREE AND EVEN STROKE. FINAL RUBBING STROKES SHOULD BE CLEAR ACROSS THE TOP WITHOUT STOPPING.

PLATE IV. REFINISHING THE DOMESTIC SCIENCE EQUIPMENT UNDER CONTRACTING CONDITIONS. "CAUGHT ON THE FLY."

Of course a certain amount of common sense must guide the operator's judgment and one who is deliberately or carelessly sloppy or wasteful, should be "jacked up." Slack methods can never be tolerated in any finishing department; much less so in the rubbing room where labor charges are increased or lessened according to the ability and judgment of the men.

From time to time, water may be freely sprinkled on the work as the rubbing progresses, but it is more practical to apply sufficient *pumice stone* at the *beginning* in order that no new material may be caught under the pad as the work progresses. It is a well known fact in rubbing rooms, that the work of rubbing the varnish, also grinds the pumice stone finer and finer; hence no fresh powder should be sifted on if it can be avoided; otherwise an unevenness in the type of gloss produced on the varnish surface will result. In treating a broad, open surface, as a table top, or wide panel, the work should be rubbed as shown in Figs. II and III. Be sure that the final strokes of such work are continuous from one end to the other in order that all rubbing marks may be removed. After using a 3"x5" hard pad for the first rubbing, it is a distinct advantage to take a soft pad for the finishing strokes which should never be omitted on last coat rubbing or polishing.

The edges of the top and similar portions may now be rubbed with a narrow, "hard" felt, ¼" thick; using the drip on the edges resulting from the top work. This should, of course, be done *after* all case and leg work, or panels, are completely finished. Small drawers should be rubbed across the ends first and then full length to finish.

Occasionally the advice is offered to beginners to do the rubbing work in a circular manner. To be frank: *Don't do it.* It produces the same effect on varnish as cross sanding does on wood. Use a firm and not too heavy pressure with a free running stroke of such length as is convenient for the work in hand. Keep the rubbing stock rather sloppy in order that the pad may do its work quickly and well. Some rubbers use a piece of haircloth to face the felt pad when first starting their work. This enables the pumice stone to lodge in the meshes and so cut faster. It should be removed, however, toward the end of the work in order that the felt may do its proper work.

On certain classes of work it frequently happens that the work is "rubbed in oil." This simply means that some form of non-vegetable oil is used in place of water. This is generally neutral parafine oil, of a grade known as "light rubbing;" or crude petroleum as it comes from the wells. For many reasons I find the results from the crude oil rubbing better than with the paraffine oil. It should, however, be used only on the cheapest grades of work, since the oil generally softens the varnish and in no way produces a job camparable with water rubbed work. As a matter of fact a piece of work can be rubbed out in water quicker, cleaner, with less chance of "rubbing through" and especially without "pulling out" than is possible with oil. In many desk and office furniture factories turning out "office golden oak" the men are using crude petroleum, pumice stone, felt pads, and haircloth since the oil is dark enough to cover any mistakes in rubbing and still produce a commercial job. Whenever a job is to be second or third coated, never use an oil rub between coats. Neither should any "sanding in oil" be done, since this will prevent succeeding coats from adhering to its foundation. It is neither practical nor desirable to rub with raw linseed, although I occasionally come across finishers who attempt it. The use of this oil quickly softens the finish and invariably leaves it in a sticky condition for a considerable length of time.

In case polished work is desired, polishing should not immediately follow the work of rubbing, but at least twelve hours should elapse to allow rehardening of the varnish. Some rubbers like to enclose the powdered rotten stone in a single thickness of cheesecloth through which it may be sifted by gently shaking over the wet work. Old billiard table felt makes a very practical pad for this work, but a firm, soft, rubbing felt is better. Never attempt to polish with a pad previously used with pumice stone, since enough of the latter becomes imbedded in the pad to defy complete removal. It is best by far to keep separate pads for each grade of work. Polishing with rotten stone in lump form is also practised in fine piano case rooms. The selected lump rotten stone is rubbed on the wet pad instead of the powder being sifted over the work. Personally I have always believed that this was simply one of the notions of the trade, no better results being obtained over rubbing with the powdered form.

On the wide, beautifully figured panels now used in fine piano cases, it is frequently the practise to "hand off" the rotten stone, by rubbing gently with the open palm in such a manner as to partially wipe off the rotten stone with each forward stroke. The rotten stone film rapidly dries out under this treatment with the result

PLATE V. REFINISHING KINDERGARTEN CHAIRS AND TABLES. THE CLASS OF WORK POSSIBLE UNDER THE FOREMAN PLAN OF GROUPED WORK, WHEREBY BEGINNERS AND ADVANCED STUDENTS CAN WORK TOGETHER IN HARMONY.

that the hand removes nothing but dry rotten stone toward the end of the operation. This results in the production of a very clean polishing effect of wonderful beauty on the high grade varnish work. Remember this, however, that this type of high grade mirror-like finish cannot be produced satisfactorily unless the varnish film is clean, free from nibs, properly rubbed out with the pumice to be absolutely true and level; and the varnish properly hardened. The work of polishing enhances the grain and beauty of the panel; and in just the same proportion it magnifies the imperfections and shortcomings of the work.

All of these things are thoroughly practical in the ordinary shop, where reasonable care, thought, and planning prevail. They are not for the careless, heedless, or lazy individual who is content to get his instruction out of a can. Although I have employed journeymen of years' experience on some of my contract work, yet I find it extremely gratifying to look at the work of my apprentice boys after three terms in the paint shop and note that very little difference is to be observed either way. Both are fine, and yet no one can say "This was done by the father and this by the son."

The school department itself should furnish the practical outlet for this experience and in illustration, Plates IV and V are offered for study. The boy nearest the camera is the foreman. To him I have given out all material, instructions and equipment. It is up to him to organize the work, provide for its orderly progression from start to finish; anticipate and prevent spoilage and accidents; and turn over a satisfactory job. It is he who gets the credit for good work; it is he who is censured if need be. He is never "balled out" in front of his group but is given all opportunity to make good on his mistakes. He commends the good work of his fellows; he sets the example in production; and more than this is given the chance to develop assurance and assume a reasonable responsibility. He is encouraged and urged if need be, to listen to the suggestions of his fellows. He is never "boss" in any sense of the word. I also make it a practise to change foreman once a month, or according to the types of job going through the shop.

Plate V shows the work of a double-class group doing beginning and advanced work in painting and varnishing. This work was done under practical contracting conditions such as any journeyman would expect to encounter. These old kindergarten chairs were changed from a dark "barn red" to a neutral light cream, to harmonize with the figured ash trim, the true color value of which does not appear in the photograph.

I trust that in this short series of three articles I have enabled others to "see the light;" to feel that the game is worth the while; that results can be accomplished under adverse conditions. Certainly, in spite of many handicaps, our own path appears brighter ahead. Success to you all.

# Suggestions for Organizing Teaching Materials

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IT seems very difficult for many mechanics, and teachers as well, to list the things that they know and can do, and to list these operations in the sequence, or the most usual order, which is followed. If they are to impart to others, the information that they have stored up within themselves; if they desire to successfully develop and promote courses of instruction in an effort to teach others the things that they know and can do, it is essential and important that they make a careful study and survey of the industry, inventorying their stock in trade and listing the things that must be known and done in that trade.

By way of illustration the writer has made an effort to analyze a division of the carpentry trade known as balloon frame construction. This analysis is submitted in the hope that it may offer some suggestions to teachers and others interested in this particular field of work.

The writer advocates and encourages preparation in advance of meeting a class. Instruction to be effective must be well thought out and organized before presentation. The progress of the student is dependent upon adequate preparation, as well as the reputation of the instructor. Furthermore, instruction should be more or less uniform in so far as teachers of the same subject are concerned. Where more than one instructor is in a given department—teachers of related work or teachers of like subjects in a city system—the instruction should be uniform. If one instructor tells a student one thing, and another instructor reverses the instruction given by the first teacher, the student does not know where he is at and his opinion of the teacher and the school is not of the best. In case of sickness, or temporary absence or change in the teaching staff, organized teaching material is a great asset to the substitute, or new teacher, who needs to know what has been going on. how much work has been covered and how thoroughly the instruction has been given, so that the work of the students may go on uninterrupted. The best teaching material is a product of time. The schools are entitled to the best services of the instructors who contribute of their time and thought in developing courses of instruction to meet certain needs. The product of their labors should be the property of the school, so that at the time of withdrawal, a successor would have some help in making a good start. With courses planned in advance, organized lesson plans and instruction sheets prepared in conference with instructors most concerned, criticisms can be reduced to a minimum, greater confidence put in both the instructor and the schools and the instruction made effective.

In preparing an anlysis it is necessary to list the things that must be known and done, with the emphasis placed on the things that must be known. Skill is developed by repetition, not by observation of the demonstrations of an instructor, although these help. Without actual practice, no amount of instruction will make a student skilful. He may be skilful without having an understanding of trade principles; but if he is to succeed in his calling, he should be given an understanding of trade conventions and principles so that he can use his skill to advantage. The writer has kept this thought in mind in preparing the following analysis, entering under each article trade information which is essential for the student to know and understand. Any omissions that may be found in the analysis can readily be incorporated under one or the other of the XXXVIII articles.

## CARPENTRY ANALYSIS.

### Balloon Frame Construction.

**I. Sill.**
- a. Cutting joints and splices.
- b. Cutting to required length. The sill should set at least 1" from the outer face of the foundation wall.
- c. Setting sill. The sill should be laid in its place in a bed of cement mortar, leveled and its angles squared to be absolutely true.
- d. Fastening sill. Joints and splices should be well spiked and if conditions warrant, it should be anchored to the foundation wall by means of bolts.
- e. Point up outside edge of sill after it has been set and anchored.

**II. Floor Joists (first floor).**
- a. Cutting to length.
- b. Sized or notched over the sill or brought to a uniform level by blocking.
- c. Framing well hole.
  1. Trimmer beams should be at least twice or three times as thick as the regular floor beams.
  2. Header beams should be at least twice or three times as thick as the regular floor beams. Fastened trimmer beams, resting in bridle between irons.
  3. Tail beams extending from header beams to the wall. Same thickness as regular floor beams. Fastened to header beam, resting in bridle irons.
- d. Laying the floor joists.
  1. Crowning side up.
  2. Spaced 16" on centers.
  3. Securely nailed to sill.

**III. Bridging (diagonal).**
- a. Split studs.
- b. Spaced in rows 8' 0" apart.
- c. Length and bevel determined with the steel square.
- d. Fastened with two tenpenny nails in each end.
- e. Nailed at the top before the flooring is laid, the bottom end being nailed after the flooring is laid.

**IV. Corner Posts.**
- a. Cutting to length.
- b. Notching for ribbon and girt.
- c. Firmly spiked to the sill.
- d. Plumbed either way.
- e. Thoroughly braced.

**V. Studding.**
- a. Cutting studs to length.
- b. Notching for ribbon.
- c. Firmly spiked to sill against each floor beam.
- d. Plumbed either way.
- e. Thoroughly braced.
- f. Fasten ribbon and gut in place, securely nailed to each stud.

VI. **Floor Joists (second floor).**
- a. Cutting to length.
- b. Notched over ribbon and sized to bring top edge in alignment.
- c. Framing well hole and chimney opening, (see first floor).
- d. Laying the floor joists.
  1. Crowning side up.
  2. Placed on the same side of the studs as the first floor beams.
  3. Securely nailed to each stud.

VII. **Plate.**
- a. Two two-by-fours placed one on top of the other.
- b. Break joints.
- c. Half lap at corners.
- d. Securely nailed to each stud and corner posts.

VIII. **Frame Openings for Windows and Doors.**
- a. Allow for window openings 5″ in height and 7″ in width, more than the finished dimensions listed on the plan.
- b. Allow for door openings 5″ in width and 3″ in height, more than the finished dimensions listed on the plan.
- c. Double studs at all openings for the purpose of gaining strength and nailing place for trim.

IX. **Sheathing, Boards (side enclosure).**
- a. Laid diagonally.
- b. Fastened with three tenpenny nails to each stud.

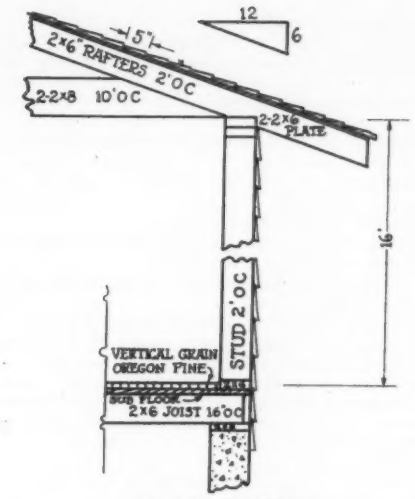
X. **Rough Flooring.**
- a. Laid diagonally.
- b. Securely nailed to each floor joist.
- c. Bottom end of bridging to be nailed.

XI. **Floor Joists (attic).**
- a. Cutting to length.
- b. Notched over plate and sized to bring the top edge in alignment.
- c. Framing well holes and chimney opening, (see first floor).
- d. Laying the floor joists.
  1. Crowning side up.
  2. Placed on the same side of the studs as the first and second floor beams.
  3. Securely nailed to plate.
  4. Ends cut to pitch of roof.

XII. **Framing the Roof.**
- a. Roof Terminology.
- b. Roof lay-out.
- c. Determine the height of the plate level.
- d. Adjusting steel square and fence.
- e. Determining length of common, jack, cripple, hip and valley rafters, with the steel square and fence.
- f. Laying out top cut for jack, cripple, hip and valley rafters.
- g. Amount to back or drop the hip rafters.
- h. Allowances to be made where rafters intersect each other.
- i. Framing dormers.
- j. Framing unequal pitch roofs.
- k. Framing conic roofs.
- l. Framing curved rafter roofs.
- m. Spaced 20″ on centers.
- n. Raising roof rafters.
- o. Securely nailed to plate, ridge and intersecting rafters.

XIII. **Framing the Cornice.**
- a. Cutting, fitting and fastening frieze, upper outside members mitered around the building.
- b. Cutting, fitting and fastening facia.
- c. Cutting, fitting and fastening plancher ceiling boards.
- d. Cutting, fitting and fastening bed and crown moulding.

XIV. **Roof Sheathing.**
- a. Four inch boards spaced 2″ apart make the ideal roof sheathing, allowing the air to reach the under side of the shingles, keeping them dry, thus giving them longer life.
- b. Stagger the joints so as to give proper bracing effect.
- c. All points should come directly over a rafter.
- d. All roof boards should be nailed with at least two eightpenny nails at each rafter. Boards wider than 6″ require at least three eightpenny nails.
- e. If roof forms part of the ceiling, or slate or asbestos shingles are to be used, the roof boards should be laid tight and perfectly matched.




WALL DETAIL

DRAWING USED FOR BUILDING A WALL AND ROOF SECTION.

XV. **Shingling.**
- a. Lay first course two ply.
- b. Shingles over 9″ should be split before laying.
- c. If shingles are not to be stained, soak them thoroughly in water before laying.
- d. Measure back the amount of exposure from the lower or butt end of the shingles.
- e. Strike a line by means of a chalked cord to which the butts of the next course are to be laid.
- f. Allow 1¼″ to 2″ projection over crown moulding.
- g. Allow 1″ projection at gables.
- h. If shingles are not stained or thoroughly wet, space ⅛″.
- i. Do not drive the heads of the nails into the shingles.
- j. Nail about 2″ above the upper line of its exposure. The covering of all nails is essential for a serviceable roof.
- k. Break joints not closer than one and one fourth inches side lap.
- l. See that joints do not come over each other on any three consecutive courses.
- m. Shingling hips.
- n. Shingling valleys.
- o. Shingling ridges.

XVI. **Flashing.**
- a. Lay pieces of flashing on hips over each course of shingles.
- b. Flash valleys about 10″ on either side of the center line, forming a continuous gutter.
- c. Flash dormers 6″ under the shingles and 8″ on the sides.
- d. Flash chimneys 6″ under the shingles and well up on the sides of the chimneys.
- e. Flash over all window caps and other wood projections, running the flashing 6″ under the siding or shingles.

XVII. **Partitions.**
- a. Cutting to length.
- b. Fastening sill.
- c. Fastening cap.
- d. Spaced 16″ on centers to accommodate 4′ 0″ lath.
- e. Any difference that may be required in spacing should be made at one end of the room.
- f. Securely nailed to cap and sill.
- g. Set straight and plumb.
- h. Form interior angles affording a surface on each partition where the lath ends may be nailed.
- i. Bridges, diagonally or horizontal.

**XVIII. Plaster Grounds.**
- a. Fasten ground or nailing strip against each stud at such a height as the top of the base, and of a thickness equal to that of the lath and plaster.
- b. Fasten similar grounds for chairrail, wainscoting, trim, etc., to provide a proper bearing to nail against, in order to avoid cracked plaster and insecure fastening.

**XIX. Lathing.**
- a. Laid horizontal.
- b. Nailed to each stud.
- c. Uniform distance apart, usually ¼", to provide for proper clinch of the plaster.
- d. Joints should be broken at every tenth lath.

**XX. Water-Table.**
- a. Cutting and fitting water-table, lowest outside trim member, placed all around the building about 1" below the sill.
- b. Cutting and fitting pitched cap or drip which serves the purpose of receiving the water which runs down the side of the house, shedding it to the ground.
- c. Water table should set level.
- d. Securely fastening water-table and cap.

**XXI. Sheathing Paper.**
- a. Cover the entire frame from the water-table to the plate over the sheathing boards with heavy weight resin sized paper.
- b. Hold the sheathing paper in place temporarily with strips.

**XXII. Corner Boards.**
- a. Cutting and fitting corner boards, the trim finishing the corners of the building, extending from the water-table to the frieze.
- b. Set plumb.
- c. Securely nailed.

**XXIII. Window Frames.**
- a. Setting window frames level and plumb.
- b. Setting central in rough opening to allow pocket room for weights.
- c. Securely fastening window frames.

**XXIV. Door Frames.**
- a. Setting outside door frames level and plumb.
- b. Securely fastening.

**XXV. Siding.**
- a. Cutting and fitting siding between corner boards, window and door frame casings.
- b. All joints should be made on studs only.
- c. If corner boards are not used, miter the siding at corners.
- d. All small panels the siding should be put on in one piece.
- e. The siding should be carefully gauged as to lap, so that the edges may be made to run in line with horizonal lines of the door and window openings.
- f. Nailed through the lower edge.
- g. Nailed only at studs.
- h. Nails set in, so that they may be puttied over.

**XXVI. Shingling (outside).**
- a. Similar to shingling XV.

**XXVII. Verandas.**
- a. Cutting, fitting and fastening floor frame.
- b. The frame should pitch ¼" in one foot from the house line to the front edge.
- c. Frame floor beams lengthwise of the building.
- d. The flooring should be laid at right angles to the building.
- e. All joints bedded in white lead and well driven up.
- f. Flooring should be blind nailed.
- g. Work a rounded nosing on the end of the veranda or porch floor.
- h. Cutting and fitting skirting board to finish under the nosing.
- i. Setting porch columns.
- j. Cutting, fitting and building up top rail (hand railing)
- k. Cutting and fitting bottom rail, usually solid stock with beveled top and moulded edge, (hand railing).
- l. Cutting and fitting balusters between top and bottom railing.
- m. Securely fastening top and bottom railing and balusters.
- n. Constructing lattice frames.
- o. Setting lattice frames.
- p. Constructing porch steps.

**XXVIII. Finished Floors.**
- a. Flooring should not be laid until the plastering is completed.
- b. Lay heavy resin sized paper over the entire rough flooring.
- c. Cutting and fitting flooring.
- d. Usually laid at right angles to the beams.
- e. Should be blind nailed.
- f. Should be well driven up.
- g. Cover the floors as soon as laid with heavy building paper to protect them from heel marks.

**XIX. Sash.**
- a. Remove parting strip.
- b. Remove pocket.
- c. Fit upper sash so that it slides easily between the pulley stiles.
- d. Replace parting strip.
- e. Secure top sash in place by nailing small blocks under the meeting rail on either side.
- f. Fit lower sash so that it slides easily between the pulley stiles.
- g. Scribe bottom rail to fit the pitch of the sill, by setting a pair of dividers a distance equal to the amount to be taken off the bottom rail, so that the meeting rail will fit snugly. With one leg of the dividers drawn along the sill, mark the bottom rail on either side with the other leg of the dividers, and cut to fit.
- h. Carry sash cord over the pulleys and cut off the required length.
- i. Make cord fast to weights.
- j. Make cord fast to sash.
- k. Replace pocket and fasten.

**XXX. Door Jambs.**
- a. Set door jamb straight and plumb.
- b. Keep jamb central between rough studs.
- c. Block jambs out from rough studs at intervals to make them straight and parallel, especially where the butts come.
- d. Keep jambs flush on either side with the plaster ready to receive the trim.

**XXXI. Trim.**
- a. Nailing on base or corner blocks.
- b. Cutting, fitting and fastening window stool.
- c. Cutting, fitting and fastening apron.
- d. Cutting trim to length or mitering if corner blocks are not used.
- e. Securely fastening trim.
- f. Cutting, fitting and fastening window stop.
- g. Cutting, fitting and tacking door stop. Stop should be permanently fastened after door is hung.
- h. Cutting, fitting and fastening, base and moulding.
- i. Cutting, fitting and fastening picture moulding.
- j. Cutting and fitting door saddle. Door saddle should be fastened after door is fitted and hung.
- k. Cutting, fitting and fastening floor moulding.

**XXXII. Doors.**
- a. Remove door saddle.
- b. Fit door so that it fits easily between door jambs.
- c. Scribe bottom rail of door allowing for door saddle.
- d. Replace saddle and fasten.
- e. Set door stop up to door and fasten after door is hung.

**XXXIII. Stairs.**
- a. Set stairs so that risers are plumb and treads level.
- b. Securely fasten to wall and floor above.
- c. If winding stairway, set strings first and securely fasten.
- d. Cutting, fitting and fastening winders and risers.
- e. Cutting, fitting and fastening carriage timbers.
- f. Setting and fastening newels and posts.
- g. Cutting, fitting and fastening hand rail.
- h. Cutting, fitting and fastening shoe.
- i. Cutting, fitting and fastening balusters.
- j. Trimming face of outside string.
- k. If open stairway, dovetail balusters into treads and replace nosing.

**XXXIV. Installing Inside Fixtures.**
- a. Setting and fastening, china closets, consol mirrors, book cases, etc.

**XXXV. Beam Ceiling.**
- a. Cutting and fastening false ceiling beams.
- b. Cutting, fitting and fastening casing to cover ceiling beams, forming panels in the ceiling.
- c. Cutting, fitting and fastening bed moulding.

**XXXVI. Wainscoting.**
- a. Constructing and paneling wainscoting as may be required by the specifications.

**XXXVII. Plate Shelf.**
- a. Laying out wall, marking height and width of panels.
- b. Cutting, fitting and fastening stiles, rails and muntins.
- c. Cutting, fitting and fastening panel mouldings.
- d. Cutting, fitting and fastening plate shelf.
- e. Fitting and fastening brackets.

**XXXVIII. Hardware.**
- a. Marking, mortising and fastening door hinges and butts.
- b. Locating proper height for lock. The knob should be about 3' 0" from the floor.
- c. Laying out for mortising door lock.
- d. Mortising stile to receive lock.
- e. Locating and boring holes for key hole and knob.
- f. Locating position from plate of lock for mortising.
- g. Mortise for plate so that plate will come a trifle below edge of door.
- h. Inserting lock and fastening.
- i. Locating position and fastening escutcheon.
- j. Locating position of striking plate.
- k. Mortising for striking plate.
- l. Inserting striking plate and fastening.
- m. Screw door stop or bumpers in place.
- n. Locating and fastening window locks.
- o. Installing miscellaneous hardware, book case and wardrobe, hinges and locks, china closets, etc.

Having completed the analysis, the next step is to break up the various articles listed above into courses of instruction. How many lessons will it take to get the instruction over? In what order should they be presented? How much time is to be allotted for each lesson? For example, the following course of study was prepared to give instruction to cover the requirements of Article XII, Framing the Roof, as listed in the above analysis.

**Course in Roof-framing and the Use of the Steel Square.**

To make this instruction effective it must be coupled with practice. A suitable shop should be provided where the students can learn by doing and given practice in the framing of complete roofs of various designs. For all practical purposes these practice roofs can be framed to the same scale as the layout, namely, one inch to the foot. The sizes of stock can be increased somewhat larger than the scale to facilitate nailing and handling. The following sizes of stock are recommended: Common, jack and cripple rafters, 3/8"x7/8"; hip and valley rafters, 3/4"x1 1/4"; and ridges, 3/8"x1 1/8". (See figure 1.)

LESSON I.

(a) Parts of the square.
(b) Essex board measure.
(c) Brace measure.
(d) Octagon scale.
(e) 100th scale.
(f) Angle cuts for polygons.
(g) Hip, valley, jack and common rafter table.

LESSON II.

(a) Roof terminology.
(b) Kinds of rafters.
(c) Roof pitches.

LESSON III.

(a) Reading roof plans.
(b) Making a working layout to a convenient scale, preferably 1" to the foot.
(c) Method of representing the rafters by center lines.
(d) Method of picking up the runs of the various rafters from the layout.
(e) Method of listing the runs of the rafters for a complete roof.

LESSON IV.

(a) Method of developing a common rafter on the plan.
(b) Method for determining the height of the plancher level.
(c) Method for determining the height of the plate level.
(d) Method for determining the size of the birdsmouth.
(e) Method for determining the distance between plancher level and plate level.
(f) Method for determining the rise in inches per foot of run.

LESSON V.

(a) Method of adjusting the steel square and fence.
(b) Method of applying the fence and square on the rafter stock.
(c) Method of measuring the runs taken from the layout.
(d) Method of working from the top edge of the rafter. The importance of accuracy in laying out and cutting to the line to avoid unnecessary fitting of the rafters.

LESSON VI.

(a) How to lay out a common rafter.
(b) How to make the proper deductions from the length determined with the steel square and fence for the cutting length of the rafter. Deduct one-half the thickness of the ridge.

LESSON VII.

(a) How to lay out a jack rafter.
(b) How to make the proper deductions from the length determined with the steel square and fence for the cutting length. Deduct one-half the thickness of the ridge and one-half the diagonal thickness of the hip or valley.
(c) How to determine the top cut to make a perfect fit against the side of a hip or valley rafter. (1) Steel square method. (2) Graphic method.

LESSON VIII.

(a) How to lay out a cripple rafter.
(b) How to make the proper deductions from the length determined with the steel square and fence for the cutting length. If intersecting a ridge, deduct one-half of the hip or valley from either end of the rafter.
(c) How to determine the top cut to make a perfect fit against the side of a hip or valley rafter. (1) Steel square method. (2) Graphic method.

LESSON IX.

(a) How to lay out a hip rafter.
(b) How to make the proper deductions from the length determined with the steel square and fence for the cutting length. If intersecting a ridge, deduct one-half the diagonal thickness of the ridge. If intersecting another hip or valley rafter, deduct one-half the thickness of the hip or valley rafter.
(c) How to determine the top cut to make a perfect fit against the side of the ridge. (1) Steel square method. (2) Graphic method.
(e) How to determine the amount to be taken off the plate level and plancher level in dropping a hip rafter.
(f) How to make the return on the facia line at the corner of a building.

LESSON X.

(a) How to lay out a valley rafter.
(b) How to make thep roper deductions from the length determined with the steel square and fence for the cutting length. Of intersection a ridge, deduct one-half the diagonal thickness of the ridge. If intersecting another valley or hip, deduct one-half the thickness of the hip or valley.
(c) How to determine the top cut to make a perfect fit against the side of the ridge. (1) Steel square method (2) Graphic method.

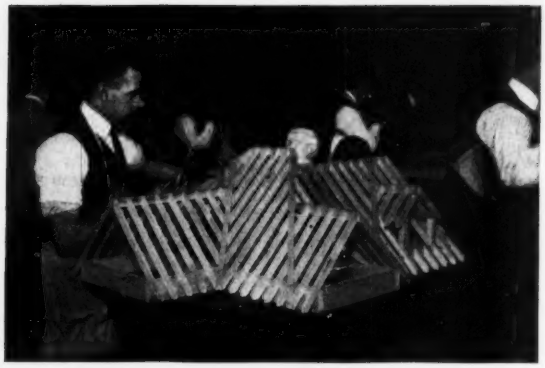


FIG. 1. A PRACTICAL PROBLEM IN ROOF-FRAMING AS TAUGHT IN THE EVENING SCHOOL, PRATT INSTITUTE, BROOKLYN, N. Y.

(d) How to move the wall line forward to prevent the need for notching the valley in at the corner or ell of the building.

(e) How to make the return on the facia line at the corner or ell of the building.

LESSON XI.

(a) How to frame an unequal pitch roof.

(b) How to pick up the bevels from the layout.

(c) How to determine the amount of backing for the hip rafters.

(d) How to determine the fit of the birdsmouth against the side of the wall of the building.

(e) How to make the proper deductions from the lengths determined with the steel square and fence.

(f) How to determine the top cuts for the various rafters.

(g) How to determine the return on the facia line at the corner or ell of the building.

LESSON XII.

(a) How to frame a gambrel roof.

(b) How to determine the proper proportions in laying out the slopes of the roof.

(c) How to determine the height of the upper plate.

LESSON XIII.

(a) How to frame a curved rafter roof.

(b) How to lay out the profile of the common rafter.

(c) How to develop the profile of the hip rafter.

(d) How to determine the amount of backing for the hip rafter.

(e) How to determine the length of the jack rafters.

(f) How to determine the top cut for the jack rafters.

(g) How to make the proper deductions where a rafter intersects another.

LESSON XIV.

(a) How to frame a conic roof.

(b) How to determine the length of the rafters.

(c) How to lay out the circular ribs or frame work.

(d) How to determine the shape of the sheathing.

LESSON XV.

(a) How to intersect rake and level mouldings.

(b) How to develop the contours of the mouldings.

(c) How to miter rake and level mouldings. (1) Steel square method. (2) Graphic method.

References.

Pamphlet issued by Sargent and Company "Standard Steel Squares." Sargent & Company, 94 Center Street, New York City.

A Practical Course in Roof-framing, author R. M. Van Gaasbeck. R. M. Van Gaasbeck, Pratt Institute, Brooklyn, N. Y.

With the course of study outlined, the teacher then proceeds to prepare his lesson plans as an aid to giving effective instruction. Lesson plans help to confine him to the particular lesson for the day. What is the object of the lesson, or what is it that he will try "get across?" What are the things that must be known and done? How many of these things have already been taught and how many remain to be taught? How is the subject matter to be presented? What equipment and supplies are needed in giving the demonstration or lesson? A good teacher goes into his classroom fully prepared with every detail of the period thought out in advance. If lesson plans similar to the following are worked out for each day's work, the instructor certainly has evidence that he has thought about his work before entering the classroom. The following lesson plan was prepared for teaching lesson XI in the above course in roof-framing:

**DAILY LESSON PLAN.**

**Carpentry—Course in Roof-framing.**

**Laying out a Common Rafter.**

**I. Purposes of the Lesson.**

(a) To have the students understand the operations involved in laying out a comon rafter.

(b) To have them interpret the working layout.

(c) To have them conform to the requirements of the specifications. .

(d) To have them pick up the measurements from the layout and apply them on the stock to be used for the rafter.

(e) To have them use the steel square and fence in a practical way.

(f) To force and compell accuracy in laying out and working to a line.

**II. What Are the Things that Must Be Known and Done?**

(a) Roof terminology.

(b) How to read a roof plan.

(c) How to interpret roof specifications.

(d) How to make a shop layout.

(e) That a layout should be drawn to a scale, preferably 1" to the foot.

(f) That the steel square is laid out in twelfths of an inch, each twelfth representing one inch full size.

(g) That the layout is a view of the roof in plan or a level surface. That every measurement taken from the layout must be applied on the side of the stock to be used for the rafter in the same plane, or on a level line.

(h) That all rafters are represented by center lines only, giving a very definite and decided location.

(i) Must be able to picture the roof in elevation while looking at it in plan.

(j) That all rafters on the layout should be numbered and a corresponding number placed on the rafter at the time of laying out, to insure ready identification and proper location.

(k) How to determine the rise in inches per foot of run.

(l) How to determine the height of the plate level.

(m) How to determine the distance between plancher level and plate level.

(n) How to pick up the runs of the rafters from the layout.

(o) How to adjust the steel square and fence.

(p) How to apply the steel square and fence to the rafter stock.

(q) That all measurements should be measured from the top edge of the rafter and either on a level or a plumb line, so that the top edges of the rafters will be in alignment to receive the roof boards or outside covering.

(r) Must know the proper deductions to make from the extreme length obtained with the steel square and fence to determine the cutting length of the rafter.

(s) Must know and appreciate the value of accuracy. Accuracy in making lines and especially in cutting to lines to avoid unnecessary fitting.

**III. What students Already Know and Can Do.**

Points enumerated in a, b, c, d, e, g, h, j.

**IV. What Remains to Be Taught.**

Points enumerated in f, i, k, l, m, n, o, p, q, r, s.

**V. Method of Presentation.**

(a) Introductory statements—brief statement of the peculiarities of roof construction and the importance of the subject in demonstrating the many uses of the steel square, calling attention to some of the figures on the tongue and blade of the square and briefly explaining them and showing that an understanding of the steel

square will greatly aid in the solution of many irregular problems encountered in practicing their trade, angles in various forms, butt and miter hopper joints, developing curved surfaces and contours for mouldings that intersect each other at different angles.

(b) Points a, b, c, d, e, g, h, and j, review, drill.

(c) Points f, i, k, l, m, n, o, p, q, r, and s, use model illustration so that students can visualize the roof in elevation before looking at plan. Point out the various roof members in their relative positions, showing the center lines of the rafters and the top edges in alignment to receive the roof boards or covering.

(d) Blackboard illustration, developing the length of the rafter on the blackboard before using the stock, getting the student familiar with roof terminology.

(e) Demonstration on the stock to be used for the rafter with the steel square and fence.

(f) Questions and answers.

(g) Repeat above demonstrations. Unless the above work is a continuation of the previous experience of the students, it is unreasonable to expect them to grasp and understand all of the information under paragraph II, yet all of the information must be known in order to make only five lines, requiring but a very short time to lay the rafter out. After sending the students to the bench and giving them a reasonable length of time to find themselves, recall the entire class back to the recitation room and repeat the above demonstrations and as some students grasp the subject, break the class up into smaller groups and finally individuals, repeating as many times as may be necessary until every student grasps the subject.

**VI. Equipment and Supplies Required in Giving the Demonstration.**

(a) Model Roof.
(b) Chalk.
(c) Blackboard eraser.
(d) Large 30 degree triangle.
(e) Straight edge.
(f) Pencil.
(h) Standard rule.
(i) Steel square.
(k) Fence.
(l) Textbook.
(m) Plan of roof.
(n) Layout of roof.
(o) A common Rafter Cut out.
(p) Try square.

The above lesson plan is an outline of the procedure the instructor is going to follow in the classroom. He has thought out how he is going to present the lesson that he is scheduled to give and has on hand everything necessary to get the lesson over. The instructor can go one step further in helping the student to help himself. Some students can get along with the minimum of help so that, if suitable instruction sheets have been prepared listing the operations in the order in which the work should be done, they would be able to proceed at least for a time without the aid of the instructor, giving him more time to devote to the students that need help.

## UNIT INSTRUCTION SHEET.

### Carpentry—Course in Roof-framing.

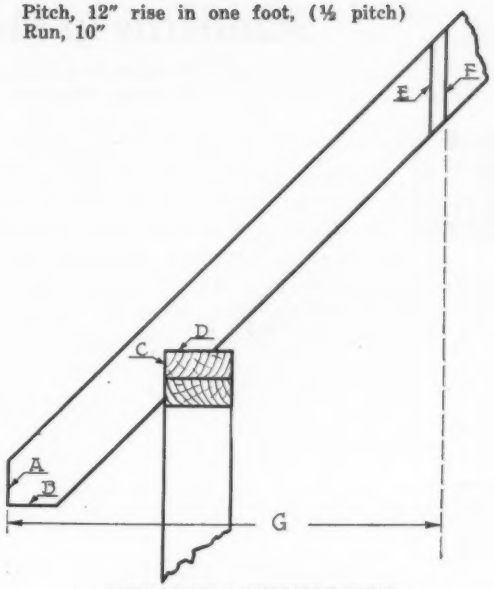
### Laying Out a Common Rafter.

**I. Objective of the Unit.**

To lay out a common rafter with the steel square and fence according to the following specifications and cut to the dimensions given.

Specifications.

Rafter stock ⅜"x⅞"
Ridge, ⅜"x1½"
Projection, 2"
Plancher level to plate level, 2"
Pitch, 12" rise in one foot, (½ pitch)
Run, 10"




DETAILS OF A COMMON RAFTER.

Key to Drawing.

A. Facia
B. Plancher level
C. Wall line
D. Plate level
E. Cutting length of rafter
F. Extreme length of rafter to center line of the ridge
G. Run

**II. Operations.**

(a) Set fence and square to proper pitch, conforming to the specifications.

(b) Select top edge of stock for working edge.

(c) With the top edge of the stock toward the operator, place the fence against the top edge with the tongue or rise and produce the first plumb line or facia line "A" to the extreme right.

(d) Slide the fence and square along and measure in on a level line from facia line "A," the run of the rafter conforming to the specifications and produce plumb line "F," the extreme length of the common rafter to the center of the ridge.

(e) Measure forward on a level line from plumb line "F," one-half the thickness of the ridge and produce plumb line "E," the cutting length of the rafter against the ridge.

(f) Begin again at the facia line and measure in on a level line, the width of the projection, conforming to the specifications and produce plumb line "C" locating the wall line.

(g) Measure down on facia line "A" from the top edge of the rafter, the width of the facia, conforming to the specifications and locate plancher level "B," marking on the blade of the square.

(h) Measure up from the plancher level, measuring on a plumb line, 2", locating plate level "D."

(i) Cut on line "A" for the facia, on lines "C" and "D" for the birdsmouth and on line "E" for the butt joint against the ridge.

Read a Practical Course in Roof-framing, pages 26, 27, 28 and 29.

POSTERS MADE BY STUDENTS IN NEW YORK CITY HIGH SCHOOLS.
The accompanying photograph was sent to the Magazine by Dr. James Parton Haney, Director of Art in the High Schools of New York City.

# Standards in Mechanical Drawing[1]

Carl L. Svensen, B. S., M. E., Assistant Professor of Engineering Drawing, Ohio State University, Columbus, Ohio.

STANDARDS of any kind are subject to change, and change signifies growth when there is a scientifically formulated basis. The standards of a fundamental secondary school subject are, and should be, such as meet the necessary requirements of today. The secondary school has emerged from its former position as a preparatory school for colleges and has come to occupy its rightful position in the educational system as an independent entity. That it is making good use of this independence is evident from the development of its courses of study which are no longer confined to "book" courses alone but include the study of subjects which lead to an appreciation of the purposes and pleasures of life.

Some of the standards by which to judge a fundamental secondary school subject are:

1. Will it contribute to the student's mental or intellectual development?
2. Has it a definite relation to other fundamental subjects?
3. Will it contribute to his material welfare?
4. Will it broaden his viewpoint as to his responsibility as a citizen?
5. Will it develop his ability to enjoy the worthwhile pleasures of life?

With these standard qualifications in mind secondary school subjects should be analyzed and their value judged as meeting present needs.

Professor French has stated that "the great popular interest in industrial and engineering work has resulted in an increased use of mechanical drawing as a means of description. It is rapidly becoming a part of our language and its influence is shown by its widespread adoption as a fundamental subject of study."

The idea of this article is to present the subject of mechanical drawing in such a manner as to inspire a certain degree of appreciation of its place in the curriculum, to place the subject in its true light as having both practical and cultural value, to give information as to some present standards as now taught, to include information as to the character, content and development of courses of study, to suggest ideas which may help to raise the standards of teaching this subject. There should be a more complete realization of the value of mechanical drawing as a cultural subject with unlimited possibilities in an educational way.

In the preface to Dean Anthony's "Mechanical Drawing," the fact is emphasized that mechanical drawing is a language. He says that the student "should be taught to regard graphics as a language study, the grammatical construction of which is developed in the Theory of Projection, * * * the subject should be taught as an art of expression rather than one of pictorial representation. Although most people recognize drawing as a medium for conveying thought, few appreciate the importance of teaching it as a language. But such it is in the fullest sense, possessing a well-defined grammatical construction, rich in varied forms of expression, forcible yet simple, and truly universal."

Professor French says in the preface to "Engineering Drawing": "It would seem that a better unity of method might result if there were a better recognition of the conception that drawing is a real language, to be studied and taught in the same way as any other language."

This conception of drawing as a language is by no means modern for the statements of James Nasmith eighty years ago might well seem to be the words of today. A few quotations from Nasmith's autobiography are worthy of reflection. "It is very strange that amid all our vaunted improvements in education, the faculty of comparison by sight, or what may commonly be called the correctness of the eye, has been so little attended to."

"Drawing is the education of the eye. It is more interesting than words. It is the graphic language."

"Mechanical drawing is the alphabet of the engineer, without this the workman is merely a hand—with it he indicates the possession of a head."

Peculiarities of tongue, geographical location, or other influences have no effect upon the graphical language. As a means of exact description it surpasses all other languages, it develops exact thinking, it develops the imaginative powers, it develops the power of accurate observation, and opens the way to the enjoyment and use of the unlimited possibilities of these powers.

The practical value of mechanical drawing and the ease of using or directly applying even a small knowledge of this subject is so evident that it needs little comment. It is necessary, however, that the larger purposes should be kept in mind.

It is, of course, a fundamental branch of study for industrial and technical training for the workman, engineer, or executive. Its importance as a practical subject is such that drawing must meet modern technical and engineering requirements. Theory alone will not do this. Mechanical drawing is, therefore, a subject with a double value, in that it teaches both theory and practice.

There has been a feeling of uneasiness, of regret, in the minds of many educators over the passing of the socalled classical education. The methods of those who spurn any subject which is not "practical" or which

[1]This article is partly based upon the author's recent bulletin, "A Study of the Teaching of Mechanical Drawing in the Public Schools, Colleges and Universities of Ohio." Published by The Department of Education, State of Ohio.

does not have a direct "dollar value" has created a certain unfavorable opinion in the minds of some educators. Drawing has suffered from this. The value of mechanical drawing as applied to the industries is so evident that its cultural value is sometimes neglected. The fact that drawing is useful does not make it any less valuable as a cultural subject. The great value of drawing is not in learning to use the instruments and tools; it is not in learning to read blueprints; it is not in learning how to represent the shape of an object by means of lines; it is not from its value as a trade or profession. Its greatest value comes from a language training, from the mental discipline of a language which requires the ability to imagine definitely, to visualize clearly, and to think accurately. It is what takes place in the brain rather than the lines on a piece of paper or blueprint, which gives drawing its greatest value.

As an aid in considering the possibilities of a certain degree of standardization it may be well to note present conditions as revealed by a survey of the subject of mechanical drawing as taught in the high schools in Ohio,[2] supplemented by information from other states.

Most high schools in Ohio include mechanical drawing, but present it as an elective study. The usual length of course is two years of five periods per week. A printed textbook of some kind is quite generally used. The courses are not standardized as generally as would seem desirable. Often the outlines of the courses vary greatly according to the teacher and are not part of a comprehensive series of progressive courses. There seems to be no uniformity in grading drawings or in keeping records. The outlines of courses as given would indicate considerable variation in the order of presenting divisions of the subject, in quality, in quantity, in care in checking and examination. The size of the finished drawings varies greatly, from 7″ x 10″ to 21½″ x 29½″. It would seem desirable to reduce the great number of sizes to those which are most used, 11″ x 15″ to 12″ x 17″, with half and double sizes where needed.

In a considerable number of schools the drawing is taught by teachers specializing in that subject. The preparation of the teachers is an important matter. In an increasing number of instances the teachers have had both school training and practical experience. It is hoped, however, that teachers will give greater attention to preparation for teaching by taking special courses in the methods of teaching mechanical drawing and in its study as an educational subject. Many teachers do not have a true conception of the largeness of the subject and its true value. Some answers to the question as to the object of teaching mechanical drawing will be of interest in this connection:

"To learn to read a drawing and to become draftsmen."

"To make drawings of simple parts."

"To read blueprints."

"To make draftsmen."

"To get as much college credit as possible."

"To train for accuracy."

"To learn the graphic language."

"I consider it an important part of secondary education. It strengthens the imagination, forms habits of accuracy and careful observations."

"This forms a part of their general education. We don't aim in our schools to turn out tradesmen as yet."

Essentially mechanical drawing is the practical application of descriptive geometry. More particularly it is the art of visual description by means of lines and figures placed on a sheet of paper in such a way that the shape and size of machines, buildings, etc., are accurately defined.

In the high schools the conception of drawing as a language can be brought out and some of the fundamental laws of projection can be explained. The ability to think in three dimensions and to visualize both shape and size can be developed.

A certain amount of geometrical constructions drawn very accurately and paralleled with the usual draftsman's methods is useful in developing accuracy and an understanding of how to locate lines, arcs, etc., when constructing views. Lettering is a part of all good high school courses in drawing. In some high schools elementary architectural and machine drawing are taught. These studies must not be too ambitious if the student is to be held responsible for a thorough understanding of every drawing and for every line on the drawing. Such subjects should not be attempted unless the teacher has had real experience in architectural or mechanical work. Mere copying or drawings not thoroughly checked give the student a false idea of the value of drawing.

The development of surfaces and intersections can be taught for simple plane and curved surfaces, but general rather than special methods of solution should be used.

Practical problems should be carefully selected for educational value. Such problems are to be encouraged, as they create an interest for the student. It is necessary for the teacher to point out the relation between such drawings and the theory of projection, so that the student may learn to "compose" as well as to "read" and "write" the graphic language.

The value of a course in drawing depends upon the proper selection of problems and the methods of presenting the problems. In this the teacher must be alive to the value of the subject and enthused with the possibilities which it holds. The use of the same problems year after year is sure to take the life and interest from the work, both for the student and the teacher. New problems and new ways of presenting old problems are essential.

[2] "Mechanical Drawing in High Schools," by Thomas E. French and Carl L. Svensen.

In the survey of mechanical drawing previously referred to, it is stated that:

"A good problem should:

"(1) Illustrate primarily one important feature of the language of drawing, a feature which will recur incidentally on subsequent drawings.

"(2) Take its place in the scale of difficulty.

"(3) Contain a minimum of repeated detail.

"(4) Be an object with whose form, use or place, the ordinary boy would be familiar.

"(5) Not be obsolete in design."

These requirements will, in general, apply to almost any course in mechanical drawing, and with some modification to advanced courses.

The use of instruments may be taught by set exercises, or by making drawings of objects which involve the same practices. Orthographic projection should receive especially careful treatment, and should be logically developed. There are several points which should be considered—the problems should be progressive, each a little more involved than the previous one. Problems should include objects requiring two, three, four or more views. The side views should be placed either at the right or left, and opposite either the front or top views. The first problems are to fix the relations of the views, and a number of objects should be drawn for this purpose. Dotted lines and sections should be introduced early in the course. Objects with surfaces parallel to the planes of projection should be taken first, then with faces parallel but at varying distances, then objects having surfaces at angles to one plane, to both planes, etc. All objects should *not* be symmetrical.

Development of any branch of knowledge has always been accelerated when previous and present facts, theories and applications of that subject have been formulated and when systematic methods of study have been developed. How to study and how to teach are two ever-present problems for the teacher. Standards for the evaluation of one's own work and for comparison of results are necessary. No subject can expect to continue to be recognized as fundamental which does not have somewhat well defined standards as to purpose, quality, and achievement.

The purpose of mechanical drawing in the high schools is in many respects the same as for other courses. This purpose is to educate, to train the mind and hand, to develop the individual so that he may live rightly, respect labor either mental or manual, and value citizenship and good government. The immediate purpose of a mechanical drawing course is to train the pupil in the greatest of all languages, the graphic language. To be sure the practical value should not be underrated but it should not dominate. Whether a boy is to be a draftsman, a cabinet maker or a machinist should not be a factor to decide whether he is to study mechanical drawing any more than the expectation of living in France or Spain should be the reason for studying those languages. The study of geography should not be limited to those who expect to travel the world over nor the study of English to those who expect to be preachers, and writers and speakers, etc. Drawing or manual arts, notwithstanding their practical appeal, should be put upon the same plane as other subjects and taught to all students.

(Concluded in May)

# The Manufacture of Shellac

## Third Article

**Rodney Brace, Homestead, Pa.**

THE following list of uses to which lac is placed will give some idea of the variety and breadth of the distribution of this product, 233,382 packages of which were produced in India in 1921. Of this crop, 157,245 packages were imported by the United States at a price varying according to quality, from thirty cents to seventy cents per pound wholesale. (A package equals two maunds; about 164 pounds.)

1. Phonograph records.
2. A constituent of varnishes, lacquers and polishes for wood and metal.
3. Sealing wax.
4. Lithographic inks.
5. Stiffening for hats.
6. A non-conductor for electrical apparatus.
7. Buttons.
8. Stiffening and polish for playing cards, etc.

In its home country lac finds a world of uses. Every village has its carpenters, cart wrights and turners, who all use lac in some form or other, either as varnish or color medium, in the production of tables, bedposts, chairs, boxes platters, carts and carriages, pails, candle-sticks, powder-boxes, fan-boxes, etc. The silver and copper smiths employ lac as a bed upon which to hammer and punch certain of their wares or to effect colored ornamentations on these in imitation of inlaying and enameling. The manufacturers of shields, swords and scabbards use lac as a varnish, while the lapidaries make their grind stones of the same material that they employ to cement the blade to the haft. The potters, bookbinders and makers of smoking pipes also use lac as a varnish and stiffening material. Painted pottery may be said to have attained a definite place as a manufactured product in a number of cities and in these places lac varnish is used to fix the colors. Occasionally colored lac is directly ap-

plied to pottery and patterns are elaborated upon it by etching. The jewelers load their hollow gold and silver ornaments or fix the stones in place with the same substance. The makers of humbler personal ornaments prepare the churis (bracelets) of the poorer class of lac and cleverly (through the same material) cause a surface dressing of tin to assume the effect of gold. The dyers and tanners employ lac in the production of some of the more brilliant shades of red and purple given to silken or woolen fabrics, or to skins and hides. The producers of agricultural and industrial implements utilize lac as the chief means of ornamentation. Lac dye figures as a cosmetic since it is often used to stain the soles of the feet and the palms of the hands of Hindu ladies. All sorts of toys are colored by it, such as playing cards, tops, nests of boxes, sets of wooden tea dishes; while marbles, pens, sealing wax, ink bottles, imitation fruits and flowers are entirely made of it.

Industrial-arts people who are interested particularly in woodwork will find some valuable suggestions in the following notes selected largely from India's government reports. It is to be noted that for all the finer classes of "lac-tourney" only the purest forms of shellac are employed. The inferior qualities of lac find their use in other industries some of which have already been mentioned. It would appear that certain results can alone be attained with a particular timber, or when certain combinations of colors have been employed. For this reason it is necessary to study the timbers and pigments in order to be successful with the art.

Plain ornamentation is one of the first classes of "lac-tourney" that comes to our attention. An article to be ornamented with lac is first turned to the desired shape, and is then polished with a fine powder made from broken pottery. This polishing has the effect of filling up the pores. Should cracks or joints exist, these are plugged with wood, inferior lac or other materials; at the same time pieces of cloth are often glued across the imperfection. Articles so treated are subsequently coated repeatedly with a preparation of glue and pottery dust. They are polished after each coating, with a sort of chisel, made from the leaf stalk of a palm. All the imperfections and points are thus made to disappear completely and a smooth and uniform surface is produced. If no cracks or imperfections exist in the wood, the article after being turned to the desired shape and polished with pottery dust, is directly coated with color. For this purpose the kharadi (or turner) takes a stick of colored lac (a batti as it is technically called) and presses it against the prepared article as it revolves in the lathe. The heat generated by friction melts it and causes it to adhere to the revolving object. By means of the wooden chisel the lac is still further distributed. The article is at last polished by a cloth moistened in sesamum or linseed oil. A peculiarity of this oil-produced polish is that it is not subject to tarnish and will not rub off, hence it effectually protects the lac from atmospheric influence. The better results are for the most part due to several layers of color and polish having been imparted, the one on top of the other. Practically all the coloring ingredients employed, except indigo, are minerals.

A second class of turning is Abri, or cloud work. Upon a surface polished as we have seen, various colored battis are worked in spots and borders and the spaces are filled in with white. Cloud effects are made in modification of this method and oil and water are sometimes used to make the pattern more interesting.

Atishi, or fire work, is popular. The peculiarity of this style may be said to be that, after the article has been carefully prepared and polished with pottery dust, it receives a coating of finely divided tin made into a paste with glue, the coating being either uniform or made up of a multitude of minute dots. Over the top of the tin, red or yellow lac is next applied, with the result that the object obtains a rich fiery, or golden glow. It is then polished on a lathe by means of a shell, known as mohra; this communicates so much heat that the lac becomes more transparent than is the case in the other methods of lac ornamentation. Other methods such as oiled and scraped work are but variations or elaborations of those already mentioned.

No doubt some mention should be made of the confused terms of "shallac" and "lacquer." This latter product is a natural varnish obtained in China and Japan by making an incision in the bark of a tree very like the American poison sumac. The varnish is taken from the tree, after it is about six inches in diameter, by tapping. This is done at intervals of from five to seven years, until the tree is from fifty to sixty years of age. A good sized tree will yield from five to seven pounds of this varnish. The product is naturally of a black color, and is applied to paper or cardboard objects, which result in the trays, boxes and other small articles which form the lacquer ware of our oriental bazaars.

In conclusion it may be well to suggest that state museums and the importers are interested in helping teachers to impart accurate information about shellac. To a limited extent they will furnish samples and photographs to those interested persons who ask for help. Clear information and objective instruction not only add to the interest which pupils take in the materials they are to use but create in them a respect for materials and tools which is seldom developed in any other way.

**FOR WELL TRAINED VOCATIONAL TEACHERS.**

**R. H. Waterhouse, director of trade extension classes in the Akron, Ohio schools recently said:**

**"The boy in the basement of the school, working at a bench or machine, should have the same well-balanced and tutored instructor that he has in his class on the floor above in mathematics, English and history. He is the same boy, and the day is going by when schools think that the basement instructor need not be of the same qualifications as those on the first floor.**

**"The same boy or girl gets a democratic attitude toward work, plus the honesty viewpoint, that can never be stressed too much."**

# INDUSTRIAL-ARTS MAGAZINE

E. J. LAKE S. J. VAUGHN
*Editors*


## EDITORIAL

### RESPONSE TO ART INSTRUCTION.

Success in teaching is measured by the response which is secured from the pupils. Evidence of knowledge is rather easily secured by direct answers to direct questions but evidence of understanding and appreciation of artistic things is secured best by examples of individual work. Few critics of art express themselves so that most folks can understand them. The great artist chooses to let his work speak for itself. Most artistic impressions lose much in the telling. This is not because most folks are incapable of appreciation but because there is no adequate and well established vocabulary for the expression of emotional impressions. In all probability there never will be.

How then may the art teacher discover the results of instruction directed to develop taste and judgment of artistic effects?

By the same methods employed to develop taste and judgment the development of taste and judgment may be expressed. A class that has been carried through a series of exercises in selecting and adjusting forms and colors to some definite purpose in design should be able to produce a prescribed result by selection and adjustment.

The response to art instruction should be a work of art performed. The art classroom may well be the quietest room in the school for in it there is least reason for verbal discussion, exclamation or response.

### WHAT'S THE MATTER WITH THE CONTINUATION SCHOOL?

The continuation school problem very naturally *continues*. It was, of course, to be expected that some of the faint-hearted well wishers would throw up their hands in despair at the first encounter with difficulties. There are terrific difficulties in the way of the continuation school. But through the shadows all the time the optimist sees a gleam of light and hope.

In the first place, the continuation school advocates accomplished the seemingly impossible by selling the proposition outright to the employers of the boys and girls. The fact is that in a good many cases the continuation school as a solution for the employers' problems was decidedly *over-sold*. In some sections, we are just now suffering from the reaction or the awakening. A good many employers looked to the continuation school with its four, five, or eight hours a week to train their workers for more rapid production. A good many school people have over-emphasized the vocational element of the part-time school, important as that element undoubtedly is. But the general continuation idea—the general improvement courses, the second chance of the school to reach the pupils, the tryout and guidance aspects of the work, and a number of other phases besides the purely vocational—all are tremendously important elements in the continuation school.

One of the greatest problems which the continuation school has had to face, and has yet to face, is the teacher problem. The assumption of practically every educator who has had no intimate contact with the continuation problem, is that the regular teachers in the public schools without further training or guidance are the proper teachers for the part-time or continuation schools. A few such teachers make good. The vast majority of them fail. They approach the continuation boys and girls with the same content and methods that in many stances drove them out of school in the beginning. They have not had contact with the world in which the boys and girls work, sufficiently to present their subjects in terms which are intelligible to the young workers.

The continuation school will stand or fall at last on the quality and strength of its teachers and its instruction. Above all, the continuation teacher needs a sympathetic and intelligent understanding of the purposes, attitudes, motives, character of employment, and nature of duties of the working boys and girls who turn from their work to the continuation school. Such a teacher must have special training, even though it be of limited duration. The continuation school can be saved to a mighty and an important work by the skilful training of its teachers. This is the big job; and the pity of it is that so few school people and colleges of education realize this fact.

The old-fashioned teachers' institutes and round tables should come back with a vengeance for the teachers of the continuation schools. Every intelligent, skilful, highly successful teacher in continuation school work should be pressed into service in the attempt to teach the mediocres and the beginners, the ways and methods of teaching in continuation schools.

### THE NEED FOR WORKERS IN SOME OF THE BUILDING TRADES.

All who are interested in the building trades have been considerably disturbed the last few years by the fact that the number of workers in many of the important trades has not only not increased but in some instances has actually decreased. The difficulty is rapidly increasing in getting skilled men for structural iron work, plumbing, carpentry, painting, brick masonry, plastering, roofing, paper hanging, stone cutting, etc.

In some of the above mentioned trades, the increase of workers has in no sense kept pace with the increase of population and of building demands, according to reports from reliable sources. Building operations are hampered on every hand by the scarcity of plasterers, brick layers, etc.

Two reasons are advanced for this situation. One is the restriction of immigration, thus reducing the general number of workers. The other is that American-born boys and young men are not entering the building trades in any considerable numbers. In some ways this last fact is rather disturbing. While the vast bulk of the world's work is in the productive, manufacturing, and building industries, and in these industries lies the hope of a large part of our population for livelihood, the fact remains that the American youth is looking more and more toward business, clerical, and professional careers.

The tendency in America is toward the condition in which great numbers will find themselves struggling with each other for the limited number of business and professional opportunities and unable by training and experience to enter the trades and industries. Under such a condition, the workers in the trades and industries would of necessity be recruited from the ranks of those who come from other countries.

Many of the older tradesmen are of the opinion that the young generation is afraid of hard work and soiled hands, and hence seeks a refuge in business and professional life from the toil and grime of the trade worker's life. But whether this reason or some other is the correct one, the fact is that there is need for intelligent, industrious young Americans to don their overalls, roll up their sleeves, and pitch into the work of the world where workers are so greatly needed, where honorable careers may be achieved, and where satisfying rewards may be won.

## HISTORY OF EDUCATION.

Sometimes one hears the history of education rather sneeringly mentioned, as if it were a matter of small moment—as if it does not hold anything of value for the modern student and teacher.

A good many of the blunders of modern education have been directly traceable to a lack of familiarity with the history of education. How can one intelligently begin work on a structure whose foundations have been wrought out and laid in the centuries and centuries of the past, unless he can have some adequate conception of the motives, methods, environments, ideals, obstacles, successes and failures of those who designed the structure and worked through the ages at its building?

One of the outstanding and fatal errors of modern life is the notion that the individual can cut himself loose from the past—that he need not concern himself with the experiences and thoughts and trials of those who have gone before. The fact is just as it was of long ago, "There is but one lamp by which our feet are guided, and that is the lamp of experience." Each generation at best can but add a modicum to the sum total of wisdom and development of the race and its civilization.

If the early advocates of manual training had been thoroughly grounded in the history and philosophy of education, manual training might have escaped the deadening formalism that so long impeded its progress. There is scarcely anything new or modern in the philosophy underlying the whole movement of manual, industrial, and vocational work for educational purposes. The emphasis has been shifted and newly placed.

One of the best pieces of advice that could be given to a young teacher at the beginning of this New Year, 1923, is to familiarize himself with all the great, epoch-making movements in education that have challenged the thought of any people or race. There are not many such movements—only a comparatively few, and the children of this generation are entitled to all the benefits that may be secured to them through their teachers' study of such great movements.

## DOCTOR JAMES PARTON HANEY.

Doctor James Parton Haney died in New York City on Saturday, the third of March. His death is a most serious loss to the development of Industrial Art and brings sincere regret to the school and commercial organizations of America which he has influenced so effectively in the interest of Art in Education and Industry.

Doctor Haney was born in New York City and was educated in the schools of the city he served so faithfully and well. He graduated from the College of City of New York and from the college of Physicians and Surgeons. While practising medicine in New York City he served as lecturer on "Medicine in Relation to Teaching" in the New York University School of Pedagogy. In 1896 he was appointed Director of Manual Arts in the New York Public Schools and has served since that time in the office of the Superintendent of Schools. In 1909 he was made Director of Art in the City High Schools. As executive director of the Manual Arts in the difficult school situation of New York City, Doctor Haney has developed instruction in the design and execution of Industrial Art to a high standard of efficiency.

Throughout his many years of service to the schools he has been a leader in national and international interests pertaining to Art Education.

Doctor Haney has ably represented American Art Education in Paris, London and Dresden at meetings of The International Art Congress.

To teachers and commercial organizations he has given splendid inspiration and instruction. One of his recent addresses before the Chamber of Commerce in Chicago was utilized by a prominent publishing house to spread the message of Industrial Art Teaching in the United States.

Doctor Haney has written extensively for many professional magazines and has edited the volume "Art Education in the United States" which is a standard book of reference on this vital subject.

THE INDUSTRIAL ARTS MAGAZINE joins with teachers of the Arts in appreciation of Doctor Haney's splendid service and in most sincere regret for the untimely and severe loss of his generous and gifted influence.

# PROBLEMS AND PROJECTS

*The Department of Problems and Projects aims to present each month a wide variety of class and shop projects in the Industrial Arts. Successful problems are invited and will be paid for. A brief description of constructed problems, not exceeding 250 words in length, should be accompanied by a good working drawing. The originals of the problems in drawing and design should be sent.*

*Problems in benchwork, machine shop practice, turning, patternmaking, sewing, millinery, forging, cooking, jewelry, bookbinding, basketry, pottery, leather work, cement work, foundry work, and other lines of industrial-arts work are desired for consideration. The editors will not accept the old hackneyed problems of footstools, taborets, towel holders, etc., which have been made from time immemorial, ad nauseum.*

*Drawings and manuscripts should be addressed: The Editors, INDUSTRIAL-ARTS MAGAZINE, Milwaukee, Wis.*

### AUTOMOBILE STOP LIGHT.

**Herbert D. Harper, New York.**

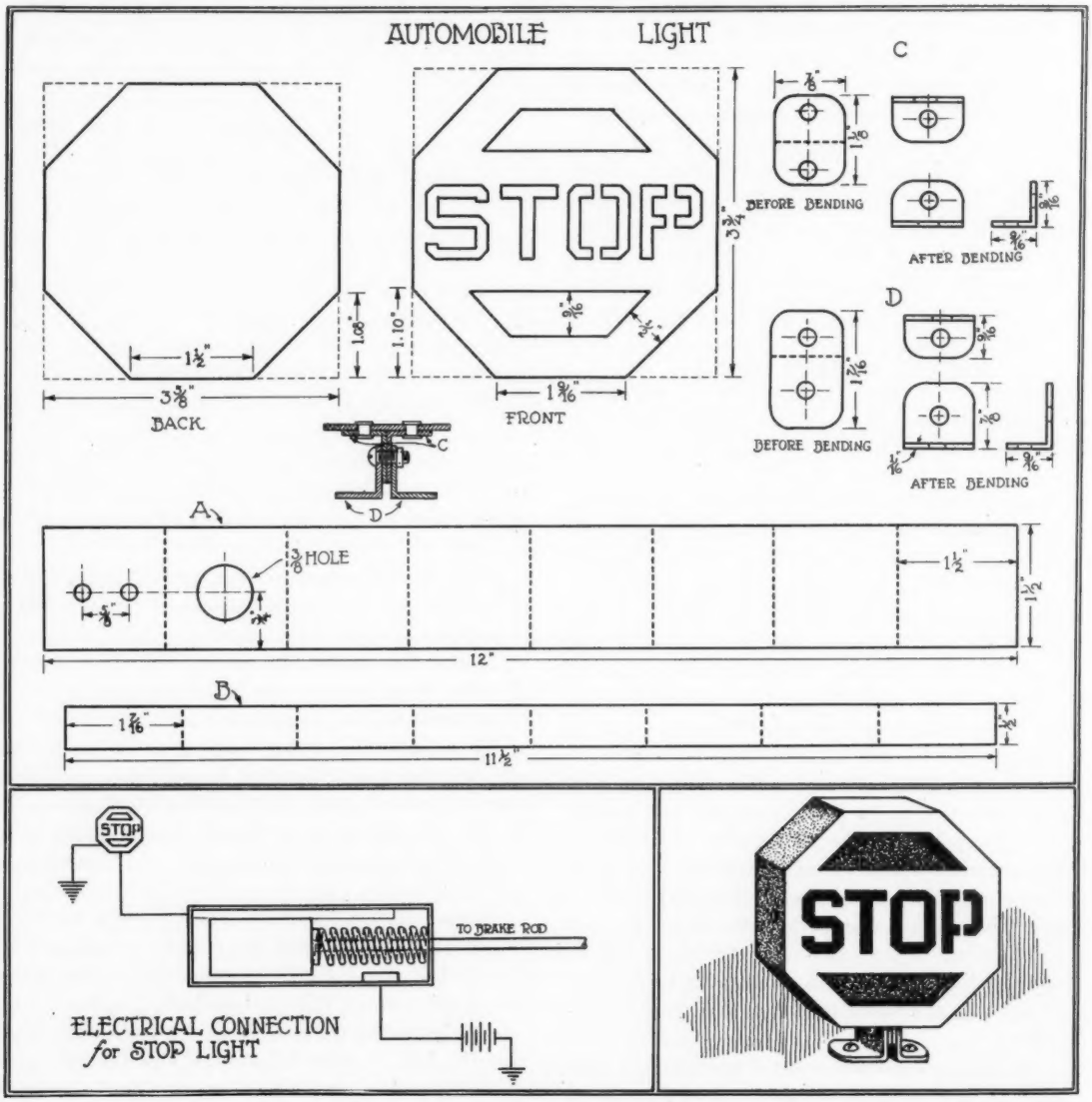
The automobile stop light is made of No. 24 gauge sheet brass. The back is made from a piece 3⅝" square. The strip A is bent on the broken lines and soldered to the back, the butt joint coming at the bottom. The ⅜" hole and the holes for the 14 oz. rivets should be drilled before the metal is bent. The front piece or cover is made from a 3¾" square, so that it may project 1/16" over the sides. The letters and the two 9/16" slots are laid out and drilled, then filed to size. Note that the inside pieces of the letters O and P remain, being held by the ⅛" strip. The strip B is soldered approximately ⅛" from the edge of the cover. It should fit snugly inside strip A, to which it is fastened by a No 8-32 screw on each side, after it has been soldered to the cover.

Two pieces of C and D are necessary as shown in the cross section assembly. These are used to fasten the light to the automobile. The glass is held in place by two pieces soldered to the cover.

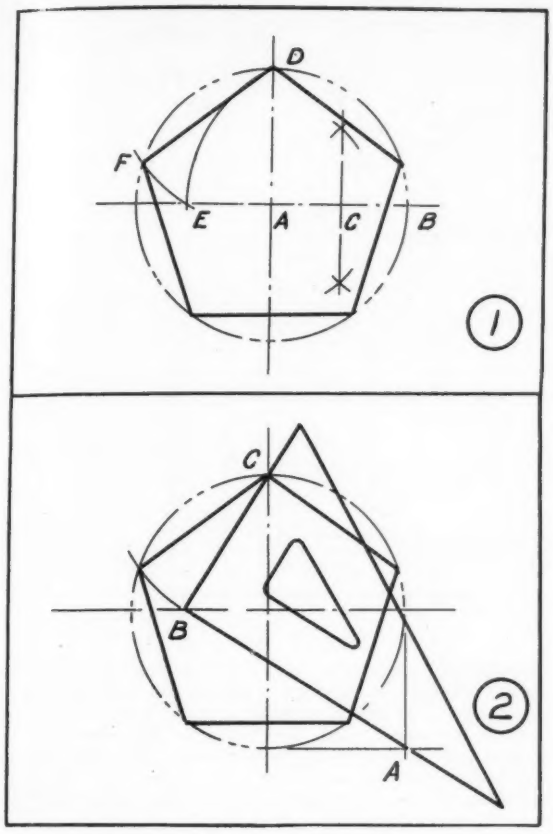
### TO CONSTRUCT A PENTAGON.

**W. W. Sturtevant, Minneapolis, Minn.**

The accompanying drawing shows a practical method of constructing a pentagon that is not generally known. At least I do not recall seeing it in any drawing textbook and it is offered as an item of possible interest to teachers of mechanical drawing.




DETAILS OF AN AUTOMOBILE STOP LIGHT.




DEVELOPMENT OF A PENTAGON.

No claim for originality is made, as this procedure has been taught to students at the University of Minnesota for some time, and may be in common use among engineers.

Fig. 1 shows the usual method of constructing a pentagon.

Bisect the radius AB to get point C. With C as a center and CD as a radius draw arc DE. Now with D as a center and DE as a radius draw arc EF. DF is one fifth of the circumference. With the compass divide the circle.

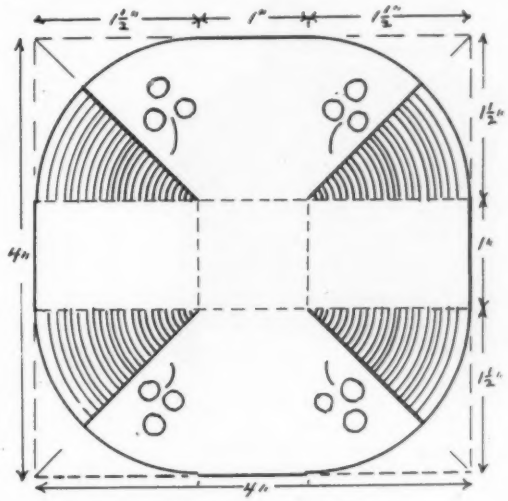
Fig. 2. Draw the circle and the center lines. Square the radius to get point A. Place a triangle so that the corner B is on the horizontal center line, one side through point A and the other side through point C.

The distance BC will divide the circumference of the circle into five equal parts.

## ST. PATRICK'S DAY FAVOR.

**Mrs. Catherine H. Richter, Des Moines, Ia.**

St. Patrick's Day has fewer projects one can work out in the schoolroom than almost any other special day. The following project is rather attractive for use on a table, as a little basket to hold nuts or mints; if the coloring is brilliant green, it adds an attractive note to the




St PATRICK'S DAY FAVOR —

decorations for the occasion. With the addition of a handle, it can be used also as a basket for other occasions. Handle can be made with the basket, all in one piece, or can be added separately.

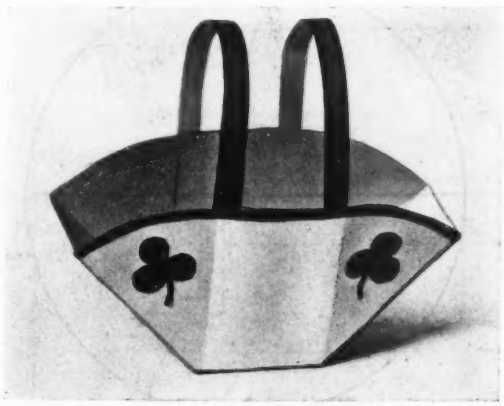
The shaded portion is the part to color green. Cut any desired design from the parts indicated; fold on dotted lines, cut on solid lines. Slip the colored parts behind the cut-out designs, and paste around the edges. The curves between the one-inch strips are quarter circles, with centers at intersections of lines forming the inner square.

## THE MAKING OF FURNITURE FOR A SCHOOL DORMITORY—A VOCATIONAL PROJECT.

**S. Lewis Land, Tennessee Polytechnic Institute.**

An interesting project for the vocational school has been worked out by the cabinet making department of the Tennessee Polytechnic Institute.

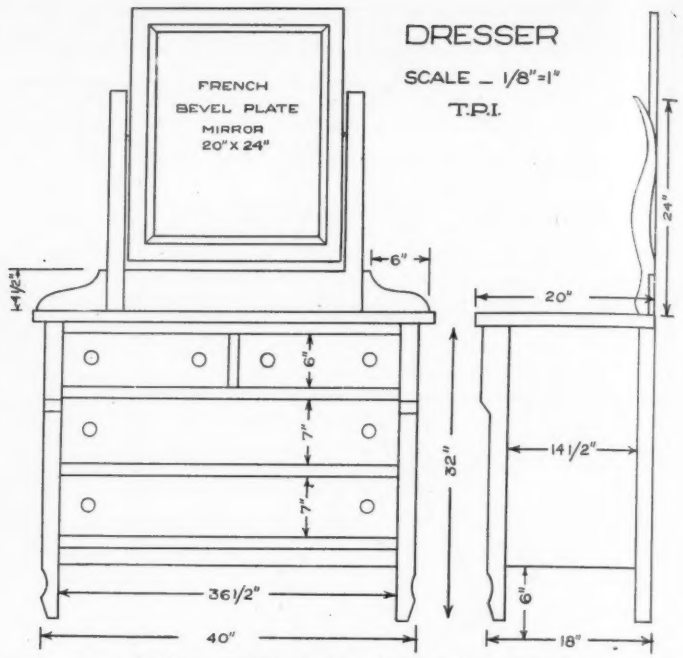
The state has just completed the erection of a new dormitory. The furnishing of this building was a matter of no little importance to those who were charged with the duty of purchasing the furniture. Quotations were obtained from furniture concerns but it was seen that furniture of good quality would be a matter of considerable expense to the school.



ST. PATRICK'S DAY FAVOR.

TABLE MADE AT TENNESSEE POLYTECHNIC INSTITUTE.

DRESSER MADE AT TENNESSEE POLYTECHNIC INSTITUTE.




The cabinet making department was asked to estimate the cost of building the furniture in our own school shops. The result was that the department was asked to build the furniture, consisting of fifty study tables, fifty dressers, and parlor furniture.

The dressers and tables were designed and drawn in the drafting classes. A bill of the necessary material was worked out, and work began. There were twelve members of the class, and the equipment was adequate to do the work.

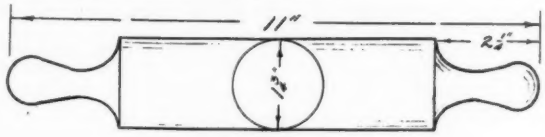
Our purpose being to train shop foremen and skilled workmen, the work was done on the factory plan of production. The plan and organization of the work was the same as would be found in any large manufacturing establishment.

The tables were first made. However they were not completed before work was begun on the dressers. When the woodwork on the tables was complete, they were stored in the finishing room, and finished along with the dressers. For lack of room in the shop, in which to assemble the dressers, only half were made to begin with. The other 25 dressers are to be made later. Since the furniture was badly needed, we did not wait to finish all the furniture together. The tables and first lot of dressers were finished, so that they might be placed in the dormitory for immediate use.

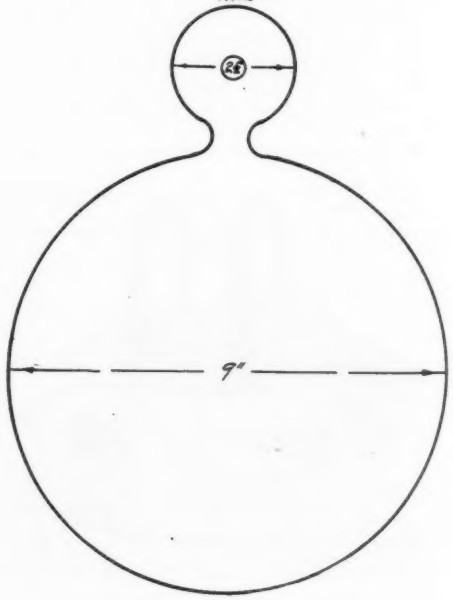
They were finished with a golden oak oil stain, followed by two coats of liquid wood filler, and two coats of varnish. The varnish was rubbed down and a coat of shellac was applied.

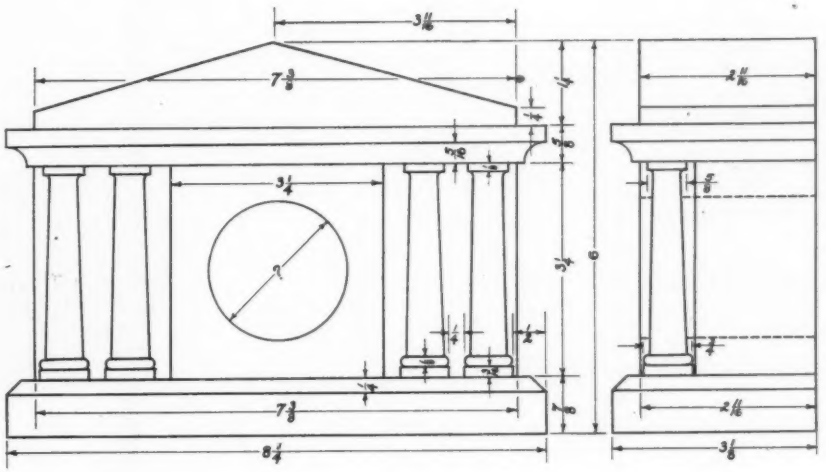
The design and method of construction may be clearly seen from the photographs and drawings. The class was so organized as to give opportunity to the more advanced students for training and practice in job analysis and foremanship. For instance, one student, a capable and advanced student, was given the task of laying out and making the drawers for the entire lot of dressers. Another student was given the job of making the frames for the mirrors. Students of less capability assisted in these unit jobs. All laying out of material, and adjustment of machines was done, however, by the "sub foreman" but was checked up by the instructor.

The project has afforded much opportunity for the training and practice of shop foreman and skilled mechanics It has given the student the same practice which he would get in the large furniture-making establishment. With a project of this size, the class may be organized, and work may be done on a systematic, factory plan of production. It makes possible a more direct contact between the school and the factory. Economically, the school has profited by the project, since the furniture was made at a smaller cost, than the purchasing cost would have been. The furniture is of a higher grade than that which might have been purchased.

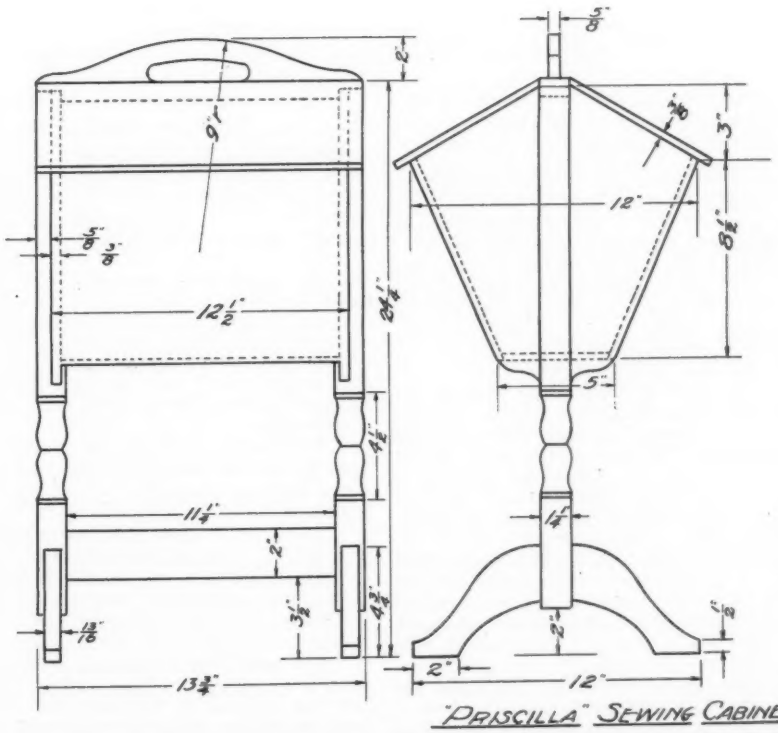



ROLLING PIN
and
BAKE BOARD
9"X12"

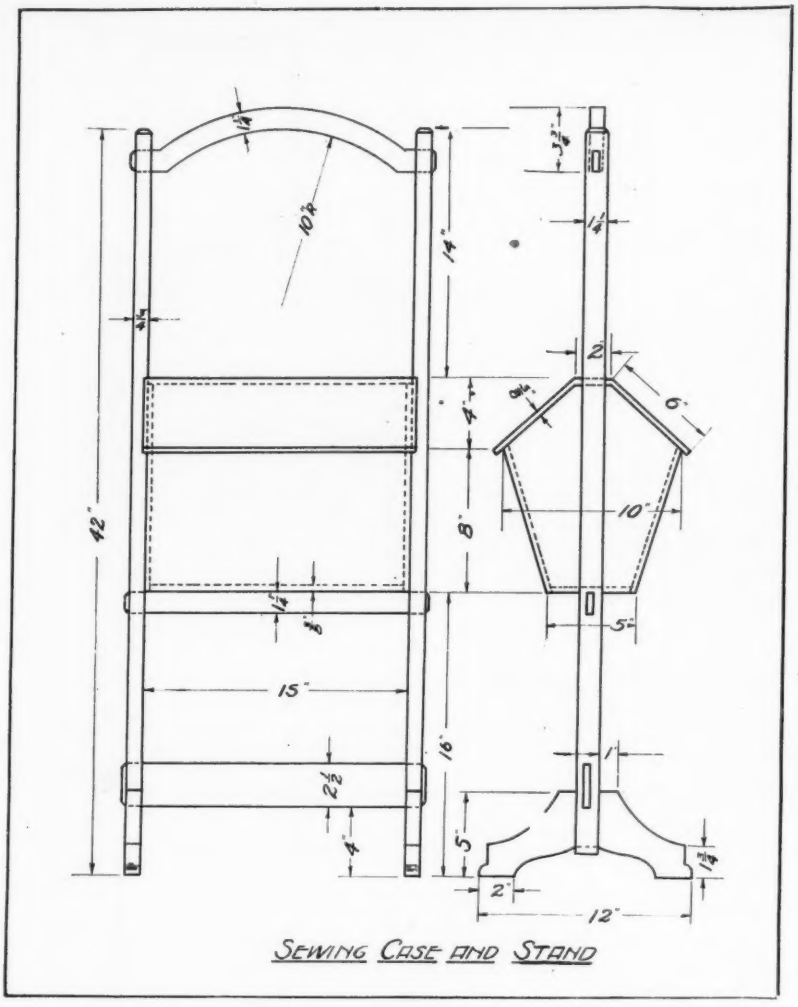




COLONIAL CLOCK
SCALE $\frac{3}{4}$" = 1"



"PRISCILLA" SEWING CABINET



SEWING CASE AND STAND.

### ROLLING PIN AND BAKE BOARD.

**Paul L. Cressman, Erie, Pa.**

The little folks in the home like to help mother bake. "Big" brother, who is getting his first lessons on the lathe, can turn a rolling pin, and saw a bake board out on the band saw, thus providing an appreciated and practical gift for his little sister. The bake board can also be used as a cutting board. The same design rolling pin and bake board half again as large would be an appropriate gift for mother.

### A COLONIAL CLOCK.

**J. L. Sanders, Springfield, Ill.**

The Colonial Clock is a beautiful little problem for the shop and it can be made in a very artistic manner. The case of the clock is made at the bench while the posts are turned on the lathe. Problems of this kind should be worked out with the utmost skill. The problem is small and the eye catches every little detail at the first glance. The posts are close together and must be perfect to produce a well balanced problem.

The wood should be some high-grade cabinet wood such as mahogany or black walnut, and should be well finished. The turned posts should be not only sanded while turning in the lathe but should be sanded by hand, with the grain of the wood, removing every small ring that usually appears in lathe sanding.

I would suggest that the workman use No. 4 and No. 6 garnet paper for the final sanding.

After sanding and assembling the case it should be stained, filled and finished with two coats of shellac, and two coats of varnish. Each coat of shellac should be rubbed down with No. 6 garnet paper (dip the paper in water to resist heat) and each coat of varnish should be rubbed with pumice and oil. Pumice and oil gives a nice satin finish, removing the cheap appearance which varnish sometimes gives to a piece of this kind.

The clock works can be purchased from any jeweler but the works from some discarded boudoir clock or a Baby Ben may be used. Old alarm clocks can be converted into very attractive mantel clocks and at a very nominal cost. The size of the hole to be cut in the front of the case will be determined by the size of the works. The dimensions of the case can be enlarged if one desires to place a larger set of works in it, such as the ordinary alarm clock.

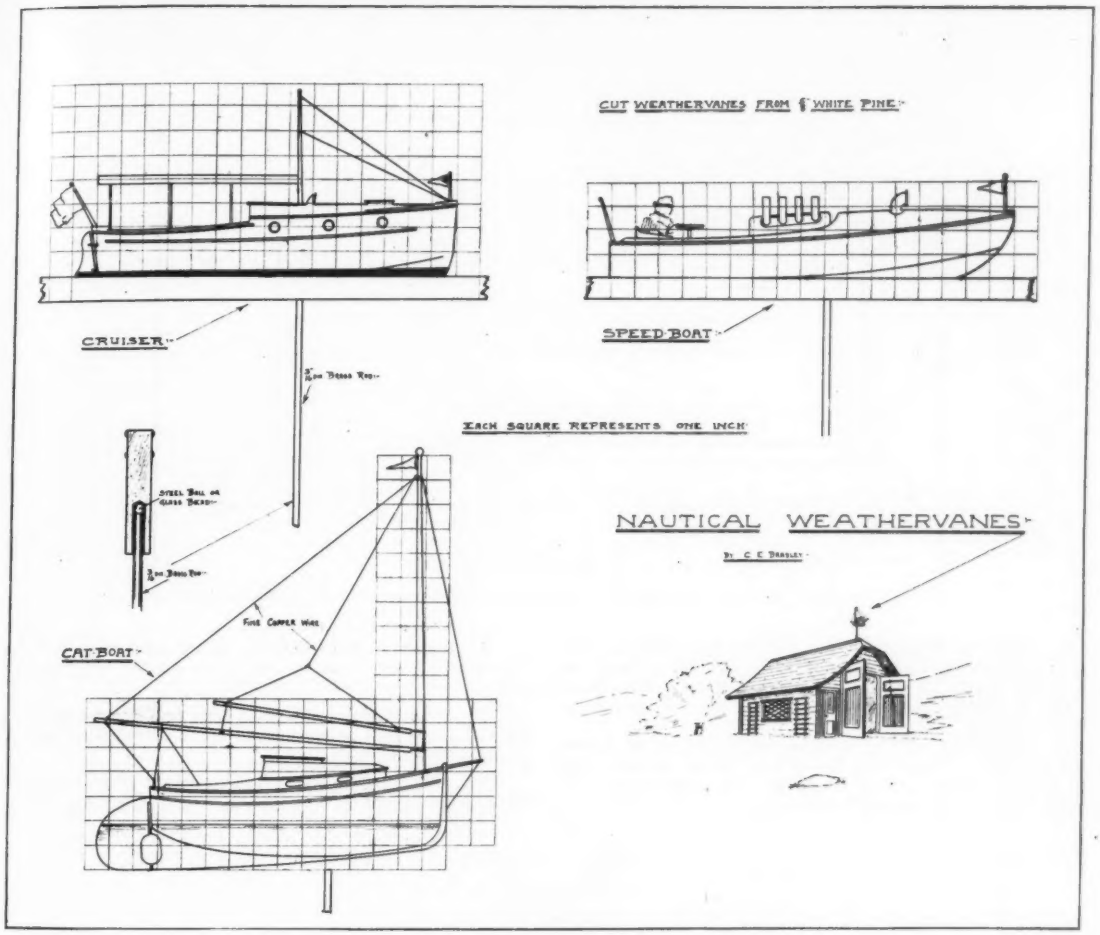
This design can be easily adapted for use as a motor boat by cutting enough of the keel away to give room for a shaft and propeller, the power being furnished by rubber bands or an old clock spring.

### SEWING CABINETS.

**F. A. Dunn, Newton, Iowa.**

These cabinets are of the Martha Washington type and afford interesting problems in advanced furniture construction. They are particularly usable where boys desire to make gifts for their mothers.

The drawings are ample to show the general construction. If a cabinet wood like mahogany is used, they are best finished by staining and varnishing. If a soft wood is used an enamel to harmonize with other furniture is most interesting and easily applied.




SUGGESTIONS FOR NAUTICAL WEATHER VANES.

## NAUTICAL WEATHER VANES.

**C. E. Bradley, Fall River, Mass.**

Nautical weather-vanes are an attractive addition to any of the buildings about the home garden or summer camp. If made from any of the light woods, after the designs illustrated in the accompanying sketch, an interesting problem for the bench wood-working class is to be had.

The work involves, first of all, careful laying out and drawing, and latterly accurate workmanship to produce the pleasing effects desired. After the designs are cut to shape, bored and trimmed with small halfround mouldings, they can be rigged effectively.

Careful painting and varnishing are, of course, also essential in order to bring out the complete nautical effect.

By following out the detailed information, as set forth in the drawings, a fascinating project for a boy's class will result.

## THE HURDLE.

**Paul L. Cressman, Erie, Pa.**

The hurdle photographed has the scars and earmarks of two seasons' service. The cabinet trade class built six of these hurdles for the track team. They offer splendid problems in joinery. The height can be adjusted from 30" to 36".

## RADIO RECEIVING SET.

**Raymond M. Bealer, Collingswood, N. J.**

Last spring the radio fever was so intense among the boys, that the writer doubted whether it would carry over to this school year. Nevertheless, some plans for it were made.

High school classes were completing their initial problem when this set, finished to the rubbing down of the final coat, was displayed. Needless to say it took the classes by storm. Many that had expensive bulb sets expressed a desire to make one.

The boys were required to provide the materials to be furnished before the cabinets were started. The following week brought quantities of oat meal cartoons, bundles of wire, and all kinds of crystal detectors. Many were so ambitious to start that they brought small wooden boxes from which to construct their cabinets.

### Work Sheet.

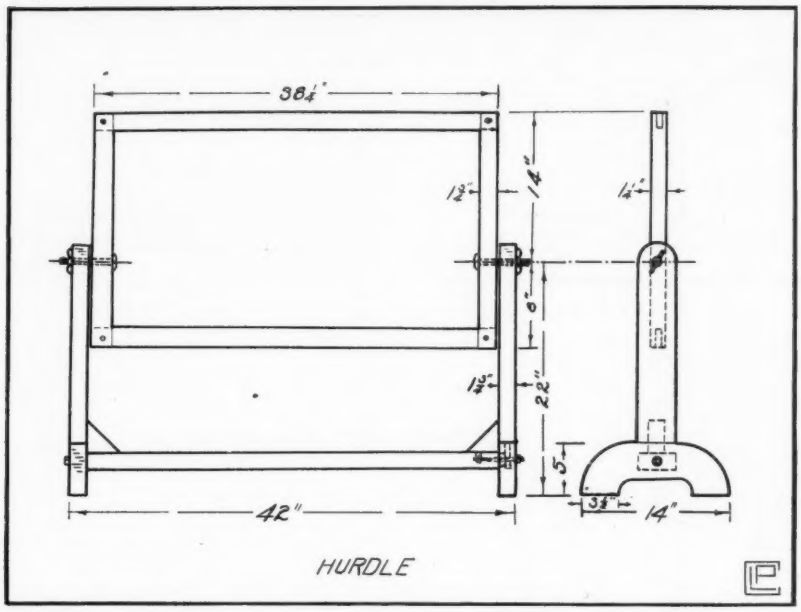
**Materials required.**

1 Oat meal carton.
¼ pound No. 22 enameled wire.
1 Dial.
1 Crystal Detector.
4 Binding Posts.

1. Fit bottom of carton with circular block and tack in place. Cut top off to indicated height, fit top block and tack. Give two coats of shellac.

2. Starting ¼" from bottom wind tightly and smoothly with No. 22 enameled wire to within ¼" of top. Shellac again.

3. Carefully plane up the ends for the cabinet, making sure that they are square and of the same size. Plane a surface of each end piece. Plane up the sides next except from one edge, with the grain, which is left rough. That is, plane to finished length, but not to finished width.



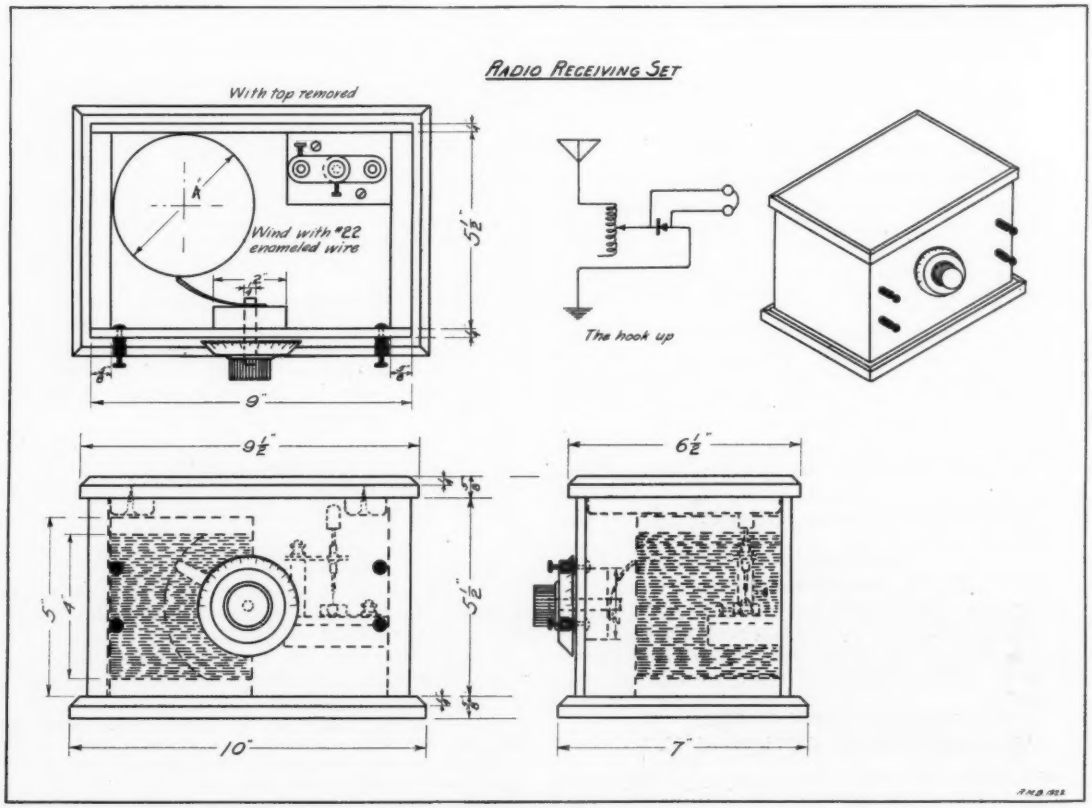

4. Glue and brad the sides to the ends, making sure that the planed surface of the ends is outside. Plane the unfinished edges to width and after setting nails, plane surface of sides. Carefully sand with No. 00 sandpaper with the grain.

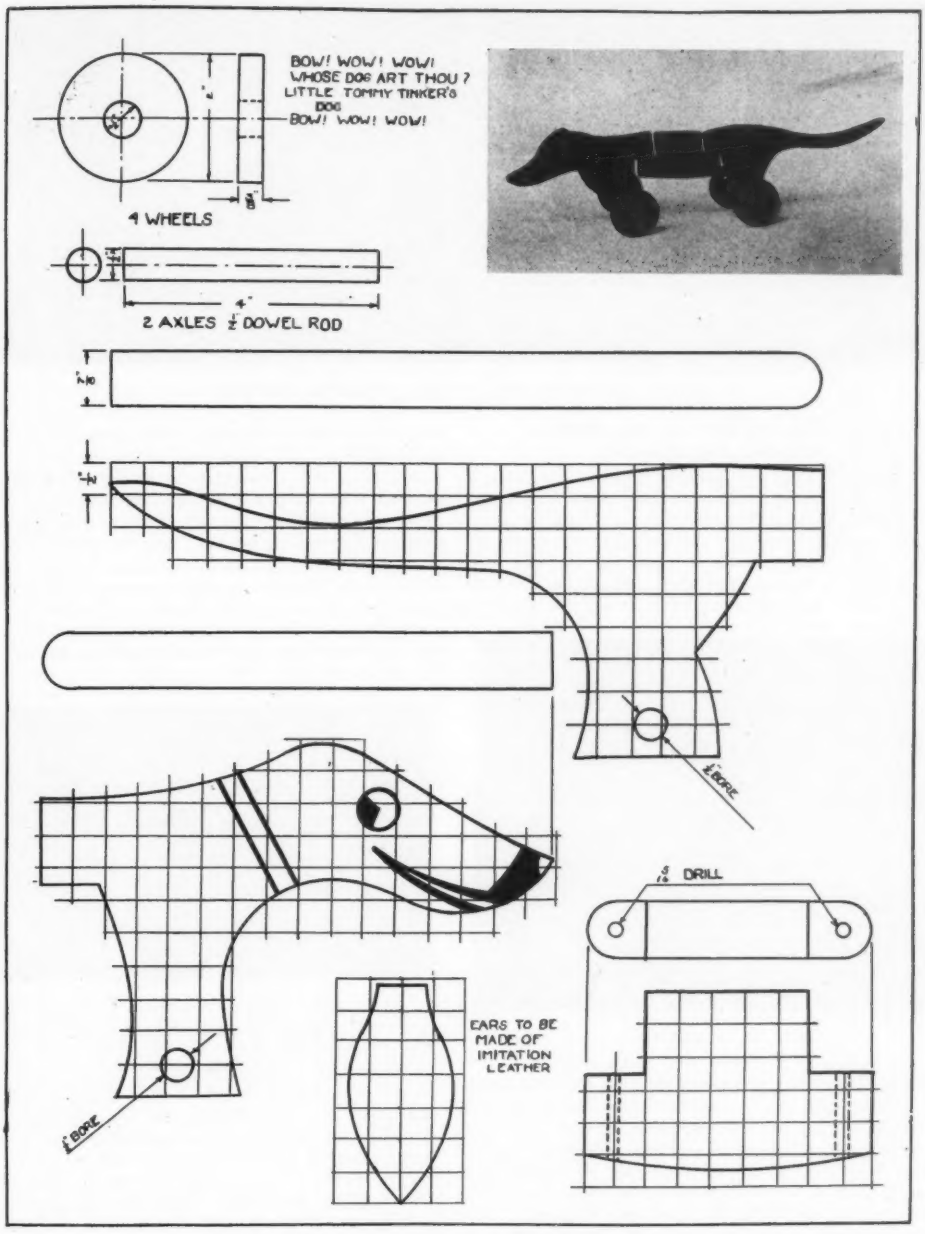
5. Plane the bottom to size, bevel and sand paper. Brad to sides. Plane and bevel top, plane surface and sand paper; cleats for top should be 1½" wide and long enough to fit a bit loosely inside box.

6. Locate center for dial shaft and drill ¼" hole. The bearing block is drilled, then nailed and glued in place.

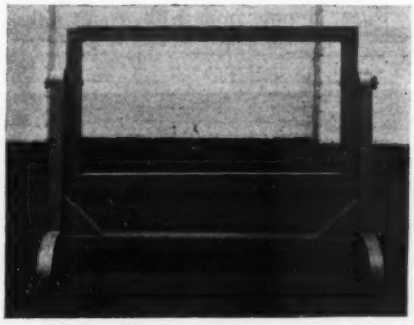
7. ¼" brass rod cut to 2" long and spring brass contact 3" long, ½" wide tapered to ¼" is drilled and soldered to the shaft.

8. Block to support detector next nailed in place. This block should be the size of the base of the detector






DOG TOY DESIGNED BY F. C. REYNOLDS.



HURDLE MADE BY MR. PAUL L. CRESSMAN.

and should be as near the top of the cabinet as the cat whisker knob will permit.

9. Place coil in position and determine the arc of the contact spring. Nails should be driven into the shaft bearing block to limit the movement of the contact spring. The wire to connect with the detector is soldered to the contact spring as near its center of rotation as possible.

10. With screws from the bottom fasten coil in place. Place contact spring and shaft. Screw detector to block. Drill holes for binding posts and proceed to wire up.

11. Test the set and make any adjustments.

12. Stain the cabinet and then shellac it. Sand lightly and give two coats of varnish, sanding between the coats. Rub down with pumice or rotten stone.

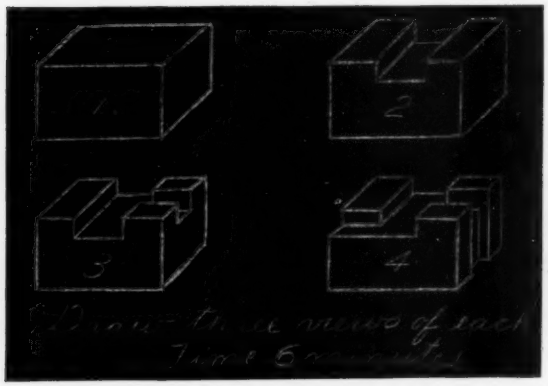
Note—A variable condenser may be added by making the cabinet longer.

A TYPICAL PROBLEM FOR A TEST IN ISOMETRIC DRAWING.

## HELP FOR THE DRAWING TEACHERS.

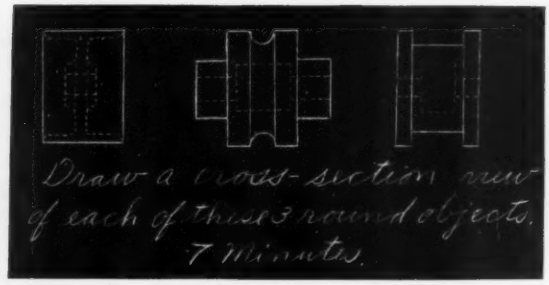
**H. H. Robinson, Augusta, Kans.**

The author has used the described drills for several years and has found them most profitable, for the amount of time required. The reader probably has found by final examinations or otherwise, that in the drawing of 30 or 35 plates a semester, a boy frequently fails to get the idea, or fails to retain it. The need for frequent drills in speed and visualization is then evident. In giving the drills it




A TEST IN PROJECTION.

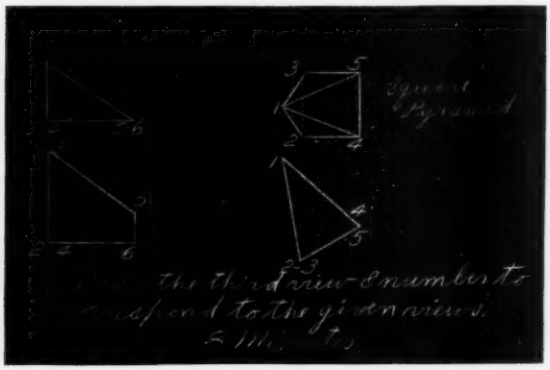
will be well, for the sake of economy, to keep on hand a supply of scratch paper cut to about four inches by five inches. If possible a piece of this paper should be put on each desk before the class enters and the test, or drill, problems (one to four in number) should be on the blackboard. There should always be a time limit, for speed is to be sought rather than technique in freehand drawing. The solutions will always be drawn freehand, but must be reasonably well proportioned and have all lines in their correct relative positions. The fact that every line has a very exact meaning may be impressed by subtracting ten or twenty percent for every wrong line; if the views are not in their correct relative positions, the drawing should be considered as worthless. Drawings can be checked, before the student, as rapidly as they are completed. If the grades are occasionally recorded, care and interest are better sustained, and too the grade is quite indicative in a sense like the Terman test results. Never let a problem pass, the solution of which is not clear. If a large number has failed, a short time should be taken at the board in explanation.

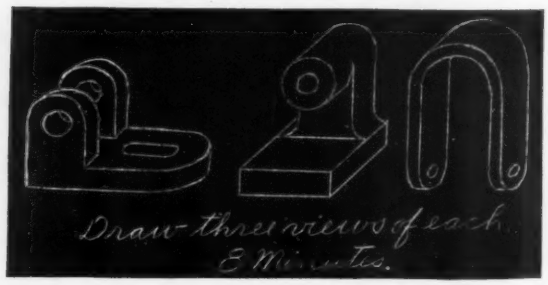



The time limit serves many purposes. Naturally the drills will become somewhat competitive and business will begin immediatly upon the entering of the class. As the drills are given quite frequently (almost daily when a new phase of drawing is taken up) they are anticipated and the boys lose little time in the halls in getting to class.

The teacher will be surprised to find what can be accomplished in the time required and with what small effort on his part. Do not take too much time in putting the problems on the board. The drawing may be made without the use of a straight edge, and the explanation may be written rather than lettered.

The problems may be made to cover almost every phase of drawing, as suggested by the accompanying blackboard sketches. Results from drill in pictorial sketching, from working drawings, are especially practical and encouraging.





## SUPERVISED MANUAL TRAINING TALKS.

**Edmund B. Alger, Teacher of Manual Training, Newton, Mass.**

In our Manual Training classes of today, the work must be broad enough to consider the everyday problems which confront every boy. The introduction of class talks with practical demonstrations and interesting discussions along present day subjects, develops and accomplishes this method with excellent results. If we are to progress in the direction of industrial intelligence, we must place more emphasis upon real recitations.

The proper amount of study should be given in the preparation of the subject at hand. This makes the presentation much more instructive to the class and makes possible the acquiring of the desired information. It offers a fine opportunity for class cooperation, because the interest is held uppermost. Some member may disagree with parts of the subject material and he has a chance to present his own ideas, promoting a valuable discussion.

The teacher should thoroughly understand the subjects which will be discussed in a manual training class in order to insure correct information. He should stay in the background, thus affording a chance for the presentation of subjects by the boys in their own original way.

Supervised class talks of this type are held in the manual training shop where the boy is made to feel more at home with the chosen subjects. A chairman and a secretary are appointed by the boys present at this period. The chairman has full authority to conduct the class according to his own ideas. He presents his talk first and controls the important additions and corrections to his own topic and on all the following subjects presented. It is necessary that this point be emphasized in order to keep all additions and corrections strictly on the topic and prevent wandering on ground that is not allowable. If this point is avoided, the class will be furnished with ideas of little or no value and acquire a confused bundle of information.

Everyday this growing world of ours is offering a vast field of subjects, which if given proper consideration, present a fine choice of classroom discussions. Among some of the leading current subjects which would interest boys are: (1) Electrical problems including wireless parts, motors, batteries, wire, telephone construction, door bells and various electrical appliances; (2) Woodworking subjects, developing information about the kinds of woods, lumbering, manufacturing of materials made from wood and woodworking problems suitable for classwork; (3) The uses of cement, introducing the history and manufacture of cement, building blocks, reinforced cement in floors and buildings, ornamented boxes, furniture and other practical problems in concrete work; (4) Household repairs present practical subjects such as the packing of a faucet, setting of glass in a window, and replacing a fuse where one is burned out; (5) Printing seems a valuable topic of discussion, developing the manufacture of paper, kinds and qualities, manufacture of type and other topics which may be found on this subject rich with material. (6) Machines and tools interest all boys. This acquaints them with the history and manufacture of tools and machines; (7) Metal work problems develop construction with tin cans and sheet metal; (8) Boats perhaps afford the greatest topic of interest not only in the building of the various types but a talk on the launching of a boat and material on model crafts.

The above outline gives a generous idea of the possibilities of a wide range of topics coupled with possible demonstrations. Material for anyone of these subjects maybe found in the current magazines and newspapers.

## DEATH OF DR. HANEY.

James Parton Haney, Director of Art Education in High Schools for New York City, died Saturday, March 3, at his residence on Third Avenue. He had been ill only a few days with pneumonia.

James Parton Haney was born in New York City 53 years ago and educated first in the public schools and later

DR. JAMES PARTON HANEY.
Died March 3, 1923.

in the City College from which he graduated with the degree of B. S. in 1888. Upon graduation he entered the College of Physicians and Surgeons and received the degree of M. D. in 1892. He practiced medicine until 1896, serving two years on the staff of the City Hospital.

In 1896 he was appointed Director of Manual Arts, (including drawing and shop work) in the New York City schools and had served since then in the office of the city superintendent. In 1909 he was made Director of Arts in City High Schools, a position which he held with notable success at the time of his death.

While still a student of medicine, Dr. Haney taught in the elementary and evening schools and was the first teacher employed in New York City to develop a system of handwork. This work he was later called upon to supervise and during his administration over the manual training department, the number of shops increased from two or three to more than sixty, with a corps of thirty art teachers and more than fifty shop teachers. From 1896 to 1909, the work was extended to include the classes of more than 8,000 elementary rooms.

Dr. Haney will be remembered most largely for his work in the high schools. It was his belief that art work should function as an integral part of education and that it should not be merely art for art's sake, but art for life's sake. He was one of the earliest advocates of the movement for industrial art, and through his initiative vocational art classes, and in fact the entire comprehensive system of art teaching in the New York City schools was developed.

Dr. Haney was widely active as a lecturer on art instruction and was prominent in the programs of various art education and industrial organizations.

He wrote frequently for the educational magazines. He was largely instrumental in the development of the New York School Art League and of similar general movements for art education in New York City.

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**Establish Industrial Arts Medal.** Mr. Michael Friedsam has recently presented to the Architectural League of New York City an industrial arts development medal. The medal is to be competed for by artists and artisans of America and is to be presented by the League to the person who contributes most to the development of art in industry during the year 1923. The medal is to form the connecting link between art and industry in the United States and is to be presented on the judgment of a committee of award of the League, of which Mr. Howard Greenley is President.

**Bricklaying School.** Apprenticeship in the building trades has never proven quite successful. A number of causes were found to be responsible for the failure of schools seeking to train apprentices. The first attempt of this kind at Cleveland, Ohio, was a failure after a period of only a few months. In May, 1922, the Building Trades Employers' Association and the Mason Contractors' Association planned to reopen the school. These organizations joined with the bricklayers' union and a permanent committee of three was appointed to establish and operate the school on lines that would secure results.

## PENNSYLVANIA FIRST IN FEDERAL VOCATIONAL SCHOOLS.

A recent report of the Federal Board of Vocational Education places Pennsylvania in the front rank in the number of vocational schools receiving federal aid. The first five ranking states with the number of schools are: Pennsylvania, 353; Illinois, 330; Ohio, 240; New York, 225; Texas, 206.

Pennsylvania ranks first also in the number of trade and industrial schools: Pennsylvania, 68; Massachusetts, 64; Ohio, 59; North Carolina, 56; South Carolina, 42.

The state also ranks first in the number of continuation school teachers: Pennsylvania, 410; New York, 366; Illinois, 261; Massachusetts, 200; Wisconsin, 123.

Similarly, the state ranks first in the number of students enrolled in vocational teacher-training courses: Pennsylvania, 2,803; New York, 1,737; Indiana, 1,154; Massachusetts, 1,124; Wisconsin, 945.

The state ranks first in the number of students enrolled in agricultural teacher-training courses: Pennsylvania, 498; Texas, 363; Wisconsin, 228; New York, 212; Missouri, 211.

The state is also first in the number of students in trade and industrial teacher-training courses: Pennsylvania, 1,883; New York, 985; Ohio, 896; Michigan, 703; Indiana, 625.

Pennsylvania ranks first in the amount of federal aid paid toward salaries of state vocational directors and supervisors. The amount of appropriation received last year for this purpose was $22,648.37, or about forty per cent of the total salaries. Pennsylvania's allotment of federal money beginning with 1922 is as follows: 1922, $329,799; 1923, $370,960; 1924, $412,121; 1925, $494,443; 1926, $576,765, and annually thereafter.

## WESTERN ARTS TEACHERS' MEETING.

The Western Arts Association will hold its annual meeting during the first week in May, at St. Louis, Mo.

Arrangements have been made for holding the convention in the Chase Hotel, which is located on one of the main street car lines, and not far from the Union Station. The hotel is in a fine residence district, somewhat removed from the noise of the city, and offers a number of pleasant rooms for the guests who will attend the meeting.

Although plans are as yet incomplete for the entertainment of guests, it is expected that there will be ample time for visits to many points of interest in and around the city. The art museum, the zoo, the municipal open air theater, the Jefferson Memorial, Shaw's Botanical Gardens, and Washington University, all offer attractions of interest to the visitor. A number of departmental parties have been planned so that teachers may have an opportunity to meet other persons engaged in work similar to their own. A special effort will be made to offer exhibitions of work of interest to teachers of art, home economics, manual training and printing.

## DISCUSS PSYCHOLOGICAL TESTS.

### Boston Society Meets in February.

At the February Meeting of the Vocational Education Society of Boston, Professor Edwin A. Kirkpatrick of the Department of Pedagogy and Psychology at the Fitchburg State Normal School spoke to the members on the subject—Intelligence and Educational Tests.

Mr. Kirkpatrick compared the method of measuring achievement and intelligence by "teacher judgment" to the unscientific and inaccurate method of measuring space by the "span." He said that this movement in the field of education and intelligence testing is for the purpose of establishing accurate and scientific standards of measurement so that there will be a science in education.

There are a large number of tests both for achievement and intelligence, representing the work of scores of researchers and an immense amount of time. Such tests have not yet been perfected, but at the present stage, they are far more exacting and dependable than the individual teacher's judgment.

Some things can be measured with a comparative degree of ease and accuracy, as for instance, knowledge of the fundamental operations of arithmetic. It is less easy to measure ability in the solution of problems in arithmetic because the arithmetical factor is involved by the factor of ability to read the problem. It is difficult to test one factor without involving other factors of intelligence.

A person's success does not depend upon the elements which are within him, but what he does in the way of co-ordinating those elements. Intelligence tests particularly should be tests of that coordination. To date, most of the intelligence tests favor a certain type of intelligence, and tests which are fair to other types must be developed.

Intelligence tests and achievement tests are a great help in the field of vocational guidance but they should be supplemented by the teacher's judgment and the study of a pupil's interest. —John I. Lusk.

## FEBRUARY ROUND TABLE MEETING OF SCHOOL CRAFTS CLUB, NEW YORK CITY.

The February program of the School Crafts Club ran true to form in fulfilling an aim for the professional advancement of its members, who are directors and instructors of industrial arts and vocational education. Many phases were dealt with, such as hobbies for the shop teacher, teacher qualifications, pupils' aims, concrete projects, and mechanical drawing superstitions. The meeting was held at eight o'clock, on the evening of February 17, in the Ethical Culture School, New York City. The fact that the Club is really satisfying a teacher need is evidenced by the constancy of the members in attendance.

Five separate round table groups formed according to the interest of those present. Then at the end of an hour all gathered together for a summary of each table in order that all might benefit.

Mr. Richard A. Beyer, Director of Industrial Work in Hoboken, New Jersey, discussed the subject, "The Shop Teacher and His Spare Time." A hobby is the putting of the personality into effect or expression of personality. In making lantern slides better results come from the use of the film pack rather than roll films for the negative. Aniline stains are used in coloring slides. There is a process for development of colors on the negative, but the hues are too sombre for projection use. Study and construction of ship models are very absorbing, with great possibilities for decoration. Mr. Beyer mentioned the use of dry docks a century age when a treadmill was used for bailing out. Great has been the progress in the means of communication within a century. Many teachers are fascinated with collections of woods, minerals, stamps, bookplates, and engravings.

"The Essential Qualifications for the Manual Arts Teacher" was the topic in charge of Mr. John J. Hatch, Director of Manual Arts Department, State Normal School, Newark, New Jersey. All attending were convinced that manual and vocational training are gaining in friends. Many prominent laymen throughout the state praised the work and urged that greater funds be made available for use. Dr. Snyder, Superintendent of Schools in Jersey City, was willing to prove to anyone that in proportion to other municipal expenses, our schools today are not costing as much as they did ten years ago. The school budget has not kept pace with other expenses of government. Mr. Hatch in his remarks put the responsibility for the occasional poor industrial work on the teacher in charge of a class. However, all manual training should not be condemned because of a black spot here and there, the exception. Many normal schools lay stress on tool processes and projects at the expense of showing the learning teacher how to teach. The manual training teacher must understand the psychology of adolescence and how to get his knowledge over to the boy. Practice teaching under the guidance and immediate personal supervision of a successful teacher is necessary in teacher training. At least ten weeks in each year of a two-year course is advisable.

Mr. Francis Mahoney of the East Side Continuation School, New York City, led the discussion on "Eighth-Year Shopwork and Its Relation to the Boy's Future Vocation." Industry expects manual training to interest a certain proportion of boys who have capacity for skilled work towards a livelihood of trade nature. Teachers should influence these to learn a trade in a vocational school or by apprenticeship where possible.

Of great interest was the table in charge of Mr. Hugo B. Froehlich, Director of Manual Arts, and Principal of the Fawcett School of Industrial Arts, Newark. His subject was "Colored Cement Projects for the Manual Training Shop." Cement projects are very hard, if not impossible, to handle unless a class comes on consecutive

days as is possible under the intensive plan carried out in Newark. Class projects in wood alone have permitted of the study of color technique and design, yet we should deal with other materials if possible. Color is capable of expressing many phases of art and decoration. Formerly color with cement meant too much of a craftsman performance for a manual training shop, where the process must not be too complicated or too messy. Mr. Froehlich now makes use of a color medium called "Petroma." This comes in powder form to be mixed with water, and is put out by the American Crayon Company, New York City, in four- and sixteen-ounce sizes. The colors are very intense, which tends toward economy. For the craftsman, teacher and student who work in color cement, "Petroma" is the only color which comes ready for use and prepared in correct proportions.

As a beginning project in cement, tiles may be used, alike in form and size, but the colors and design should have the stamp of individual initiative. Tiles from plaster molds are too complex for manual training and belong with art and craft schools. For the form, strips of wood with squared ends are held by nails not driven home. This is placed upon a manilla card base. Both wood and card are oiled with linseed oil or machine oil. Plastiscine or Italian Wax is used to putty the joint between the form and card, to prevent water from draining from the concrete. The first layer, of one-eighth inch thickness, is a neat mixture (Portland cement and water), which is allowed to stand for thirty minutes before the form is finally filled with a two-and-one wet mixture. Sand or marble dust may be used. The form is left for 24 hours before removal, when the concrete is still green enough to take extra cement or color. A design may be raised with a neat mixture applied with a modeling tool. The mixture should have the consistency of putty. The design has been previously pencilled on the tile by drawing around a pattern in paper. Next different Petroma colors are mixed with water and the design is painted. Portland cement may be used to lessen the intensity of the colors if desired. Here is a splendid opportunity for a lesson in color harmony.

Projects in cement may be made more intricate by adding the factor of a depressed design. This calls for more than a flat bottomed mold. Wood and linoleum have not been satisfactory for making this depression, yet modeling clay or Plastiscine are splendid. The Plastiscine is better because it does not dry out and may be used again. The depression may be as simple as a disk in form. Plastiscine is rolled out flat on window glass and cut with a cookie cutter or knife. A form is used as before in molding the concrete oil being painted onto the Plastiscine and glass base as well as the form. After 24 hours the raised work and color may be applied as before.

Other cement projects shown were bookends, door stop, and flower pot. The core of the flower pot form was of tin derived from tin cans. Two pieces in the form of a letter U were crossed and the corners puttied and rounded with Plastiscine. After 24 hours these are easily removed, by bending inward, and raising first one and then the other piece.

Dr. Ernest B. Kent, Director of Manual Training in Jersey City, assisted by Mr. Allen D. Backus, Supervisor of Manual Training in Newark, and Mr. Mark J. Corcoran, Supervisor of Manual Training in Elizabeth led the discussion on "Mechanical Drawing Superstitions." First the contention was discussed as to whether mechanical drawing had disciplinary values as many teachers claim. Latent ability may be brought out but no value is derived where capacity is lacking. Also there is the contention that every boy can use a knowledge of mechanical drawing sooner or later. However, one can not name uses other than work of an engineering or scientific nature. Furthermore some claim blueprint reading is best learned through drawing but experience has taught that more benefit is derived through study and discussion of blueprints themselves. The majority of boys should receive training in making working sketches. On the other hand, Mr. Backus believes drafting has a truly educational value and is a masculine-he-man subject which all boys should know something about. Eighth-grade boys should know how to make a blueprint. Mr. Corcoran feels that mechanical drawing is a most neglected subject. He would use a projection box with beginning classes and stress freehand sketching. Lettering should be taught with working drawings and not separately.

—Lloyd F. Stair.

## INDUSTRIAL EDUCATION TEACHERS OF OKLAHOMA MEET.

The Industrial Education Division of the Oklahoma Teachers' Association met February 8, 9 and 10, at Oklahoma City.

Dr. Arthur Dean, of Columbia University, who was the principal speaker, discussed in an informal way his early experiences in industrial arts work, and commented on two books written during this time which outlined the method of procedure. Dr. Dean stressed the value of magazines and the benefits to be derived from attendance at educational gatherings, where teachers gather to discuss the problems they meet in their classes. At the afternoon session the old course of study as planned by the Committee of Ten and the "cafeteria" course of study were discussed and valuable points emphasized. The advantages of the part-time and evening schools were touched upon. It was brought out that a vocational counsellor is needed in the average high school in order to help the students in selecting suitable courses.

Dr. Charles W. Briles assured those interested that another course in foremanship training would be established at the A. and M. College, at Stillwater, in June next. Good results were reported from the work last year and teachers will be encouraged to attend this year. Other speakers at the meeting were Dr. R. G. Augustin, Decatur, Ill., and Dr. Wm. F. Russell, University of Iowa.

The association, in a resolution, asks the legislature for sufficient funds for a state department of education, to secure the services of a state supervisor of industrial arts.

The association claims a membership of three hundred teachers. These teachers have under their charge an average of $700 worth of equipment and a large number of boy students.

At the business session, the association elected the following officers: President, N. O. Horning, Tulsa; Secretary-Treasurer, Harry W. McKimmey, Oklahoma City.

—Hugh Norris.

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**Spring Kite Tournament.** The manual arts department at Rock Island, Ill., plans to hold a kite tournament in May. The local sash and door works will furnish the sticks for the kites, and the Rotary Club of the city will be present the day the kites are flown. The kite tournament will be similar in character to those held in other cities and will be on a scale in proportion to the population.

TEA TABLE SET MADE IN THE CLASSES OF MR. N. E. STUDEBAKER, HOUSTON HIGH SCHOOL, HOUSTON, TEX.

# NOW, ARE THERE ANY QUESTIONS?

*This department is intended for subscribers who have problems which trouble them. The editors will reply to questions, which they feel they can answer, and to other questions they will obtain replies from competent authorities. Letters must invariably be signed with full name of inquirer. All questions are numbered in the order of their receipt. If an answer is desired by mail, a stamped envelope should be enclosed. The privilege of printing any reply is reserved. Address, Industrial-Arts Magazine, Milwaukee, Wis.*

**Qualifications and Certificates for the Teaching of Manual Training.**

330. Q.—In the October issue of the Magazine, it is announced that the Chicago board has raised the salaries of manual arts teachers 25 per cent. What is meant by general certificates? What is meant by limited certificates? What are the required qualifications to obtain a high school manual training position? In the grammar grades, what degrees are required, how many hours of education, and how much experience?—W. L. L.

A:—A general certificate for teachers in Chicago high schools requires credentials showing graduation from an accredited college and two years successful experience in graded schools, or the completion of required work in the Chicago Normal School, and a year of experience in graded schools. Applicants for these certificates will be examined in one major and three minor subjects and must attain an average of 80.

A limited certificate is granted for special teachers of commercial subjects, manual training, mechanical drawing and household arts. The certificate may be obtained by one who is a high school graduate and who has had at least three years of special training in the subject which he wishes to teach. In the case of manual training, six years of special training in the subject he wishes to teach may be substituted for high school graduation and three years of special training.

Candidates for this certificate must pass an examination in a major subject which they desire to teach and in three minor subjects.

A general certificate may be obtained with a manual training major, provided the applicant is a college graduate and has had two years of training in his special subject.

Candidates for certificates to teach manual training in the grades are required to have (a) a high school diploma, (b) two years' training in a training school, and (c) two years of actual teaching experience. The candidates must take an examination in a manual training subject and in history, English and mathematics, the last three being the same papers which are written by candidates for elementary teachers' positions. In a sense, the teacher of elementary manual training must have a higher preparation than a teacher of the same subject in the high schools. It is considered desirable in the Chicago schools that the elementary manual training teachers offer their work in close coordination with the grade work and that they be more skilful as teachers and fully as skilful as mechanics as the high school instructors.

Teachers in the high schools receive a minimum of $2,000 with annual increases of $200 up to $3,800. Instructors who hold a limited certificate receive a minimum of $1,800 and may be promoted with annual increases of $200 up to $3.300. In the grades, teachers receive a minimum of $1,750 and a maximum of $2,750.

**Antique Finish on Plaster Paris.**

333. Q: We are anxious to find a good method for treating modelled plaster of Paris (boxes), which will give a good antique finish and one that will be deeper tone than ivory.—M. McG.

A: Practically all commercial casts are finished in one of two ways. First, by giving successive coats of raw linseed oil to which has been added one teaspoonful of drier per quart and allowing from three to seven days drying between coats. If coloring is desired, it may be secured through the addition of oil soluble materials of the aniline type. These, however, should be added very cautiously. Over this base glazing colors may be used to secure the vari-colored high lighting effects as for instance. In the production of an old ivory on the high lights and a brown tone at the base of the relief, such as might be produced by accumulations of dust in time, this is secured by adding raw umber, raw sienna and Van Dyke brown to a glazing liquid made of one-third raw linseed oil, one-third turpentine, one-third benzine and a teaspoon of japan drier per pint of mixture. This is thoroughly brushed on with a soft brush of the camel's hair type and within a few minutes wiped off with a cheese cloth pad so as to leave the glazing color only in the base of the relief work. For glazing use only the quality furnished to artists or automobile makers in quarter pound tubes or less. Of course, with this treatment an infinite number of color schemes may be produced being limited only by the producer's ability to secure pleasing color combinations.

The second commercial method employs the use of paraffin of the paro-wax grade which is melted and with small amounts of dry zinc oxide, French ochre or raw sienna added. The cast is warmed to about blood heat, 100° F. and the material brushed on with a soft brush, endeavoring to distribute the material as evenly as possible. This is applied in several coats with the idea of entirely filling the pores of the cast. It should be allowed to cool and then may be buffed and polished with a stiff bristle, clean, shoe polishing brush. It may be necessary to wipe off the cast in some portions to remove excess paraffin material. This should be done before the cast is entirely cool in order that sufficient material may be removed or replaced to suit the ideas of the operator.—**Ralph G. Waring.**

**Finish for Gumwood.**

341. Q: What is the best finish for gumwood, varnish finish?—R. O. B.

A: Gum wood may be finished in a number of different ways. Perhaps one of the most pleasing effects may be secured by completely sanding the work glass smooth with at least worn out 00 paper, dusting off and giving a coat of oil, raw linseed preferred which has been reduced with from two to three volumns of turpentine with the addition of one tablespoon of dark japan drier per quart of mixture. After applying the oil coat the work should be allowed to stand at least a week in a warm place and may then be given a coat of fresh orange shellac containing not more than two pounds of gum per gallon of alcohol. When dry it should be sanded smooth with a split 6-0 paper dusted off and varnished with a high grade floor varnish. When dry this should be sanded level and free from nibs with a split 6-0 paper dusted off and revarnished. Dry and sand as before. Revarnish, dry one week at 80° F. and rub with felt pad, FF pumice stone and water. If necessary revarnish and rerub.

The above treatment will bring out the unusual natural beauties of grain and color but the wood lends itself readily to a number of shades of Van Dyke, Tobacco and other browns as well as mahogany, in which case it finds its greatest use today.—**Ralph G. Waring.**

**MR. M. G. BURTON PASSES.**

Mr. Myron G. Burton, assistant superintendent of schools in charge of vocational education, Kansas City, Mo., died at his home on February 21st, following a two-day severe illness. Mr. Burton was 42 years old. He had suffered from diabetes for four years.

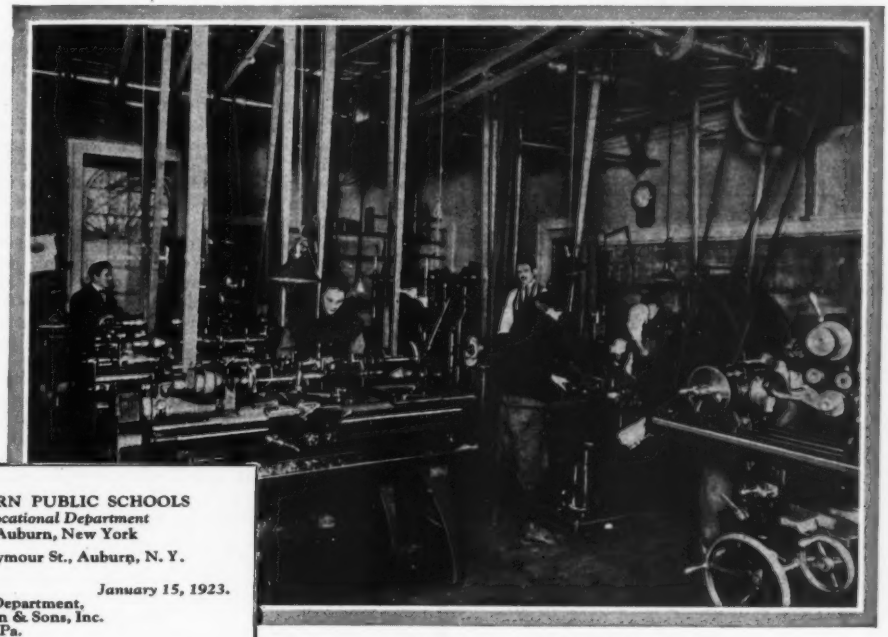
Mr. Burton was born in Hamilton County, Indiana, in 1880. He received his education in the public and high schools of Westphalia, and also in Indiana University and Muncie Normal Institute. He also completed special work at the Kansas Agricultural College, Manhattan, Kans., and at Muncie Normal Institute, Muncie, Ind.

Mr. Burton following his college work, had taught in various capacities in Illinois, Indiana and Kansas. For the last four years he had been connected with the Kansas City schools, coming there from the Kansas State Agricultural College.

Mr. Burton was well known for his contributions to the educational literature of the industrial arts field. He was the author of "Shop Projects Based on Community Problems" and in conjunction with other teachers, produced "School Sewing Based on Home Problems" and "Cooking for Schools." He contributed considerable, helpful material in the form of bulletins, pamphlets and magazine articles on industrial and vocational subjects.

Mr. Burton is survived by his wife and three children.

# Better Work



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*January 15, 1923.*

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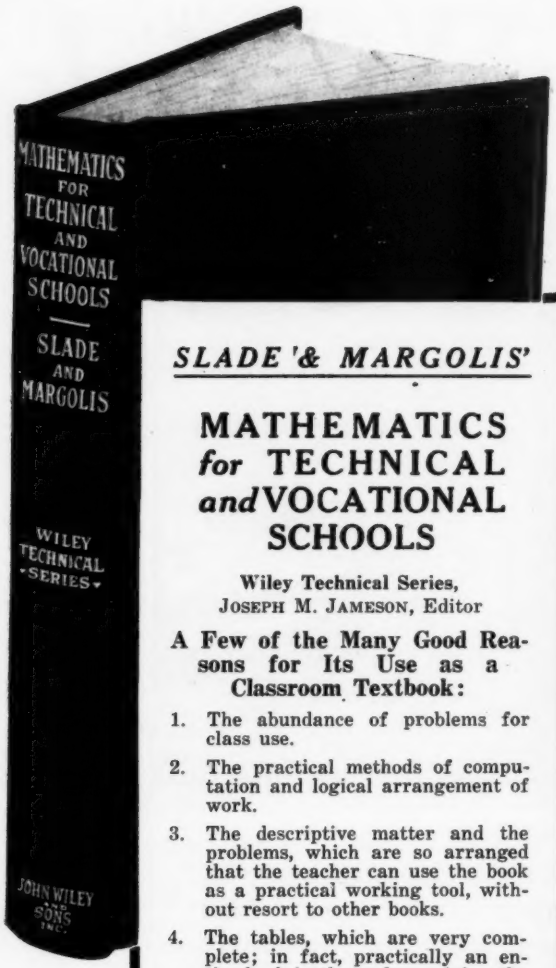


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IAM 4-23


## NEWS AND NOTES.

**Trade School.** The new building program of the Boston school board provides an appropriation of $260,000 for a trade school for boys and $400,000 for a trade school for girls. A further appropriation of $500,000 is made to provide suitable accommodations for the continuation schools.

**Home Furnishing Course.** A series of talks on home furnishing and interior decorating was given before the home making classes of the La Crosse (Wis.) Vocational School recently. The talks were followed by a visit to one of the local rug and drapery stores where the pupils saw at firsthand the things about which the lecturer had talked. Among the things stressed in his talks, were enthusiasm in work, thrift, and intelligent shopping.

**Add Vocational Classes.** Three additional vocational classes have been established at the Woodward Technical High School, Toledo, Ohio. The new courses comprise motor mechanics, tailoring and sheet metal work. Half of the pupils' time is spent in classwork and the other half in shopwork.

**Brick-laying Class.** As a result of the work in bricklaying carried on at West High School, Salt Lake, Utah, full-sized cottages, chimneys, brick floors and many types of walls have been produced. All phases of the work are taught, including plan reading and estimating. The work is intended to produce skilled workmen to meet the demand for men in the trade.

**Building Course.** Thirty-one students were enrolled in the new federal class for carpenters and builders which has been established in the high school at Topeka, Kans. The students receive instruction in blue print and plan reading, estimating, stair building, steel squaring, roof framing and other phases of carpentry. Twenty-five men have enrolled in the drafting class for the teaching of machine drawing, architectural drawing and other subjects.

**Brick-laying Class.** A class for brick-layers has been established at the vocational school, Louisville, Ky., as the first step in establishing a training school for the building trades. The school has the cooperation of building contractors who have promised to secure employment for students who complete the work.

**Exhibition of Grade Work.** An exhibition of handicraft work done by sixth, seventh and eighth grade pupils of the Libby School, Chicago, was held early in January at the School Auditorium. Youthful cooks, milliners, dressmakers, carpenters and printers exhibited their skill in products which they had made.

**Career-Finding Bureau.** Assistance to young people in the selection of a career is the purpose of a state-city employment bureau to be opened at Cleveland, O., under the direction of Mr. B. C. Seiple. It is planned to give more attention to vocational direction and counsel.

**Automobile Course.** An automobile course has been established at the evening school, Stockton, Calif., with the opening of the second semester.

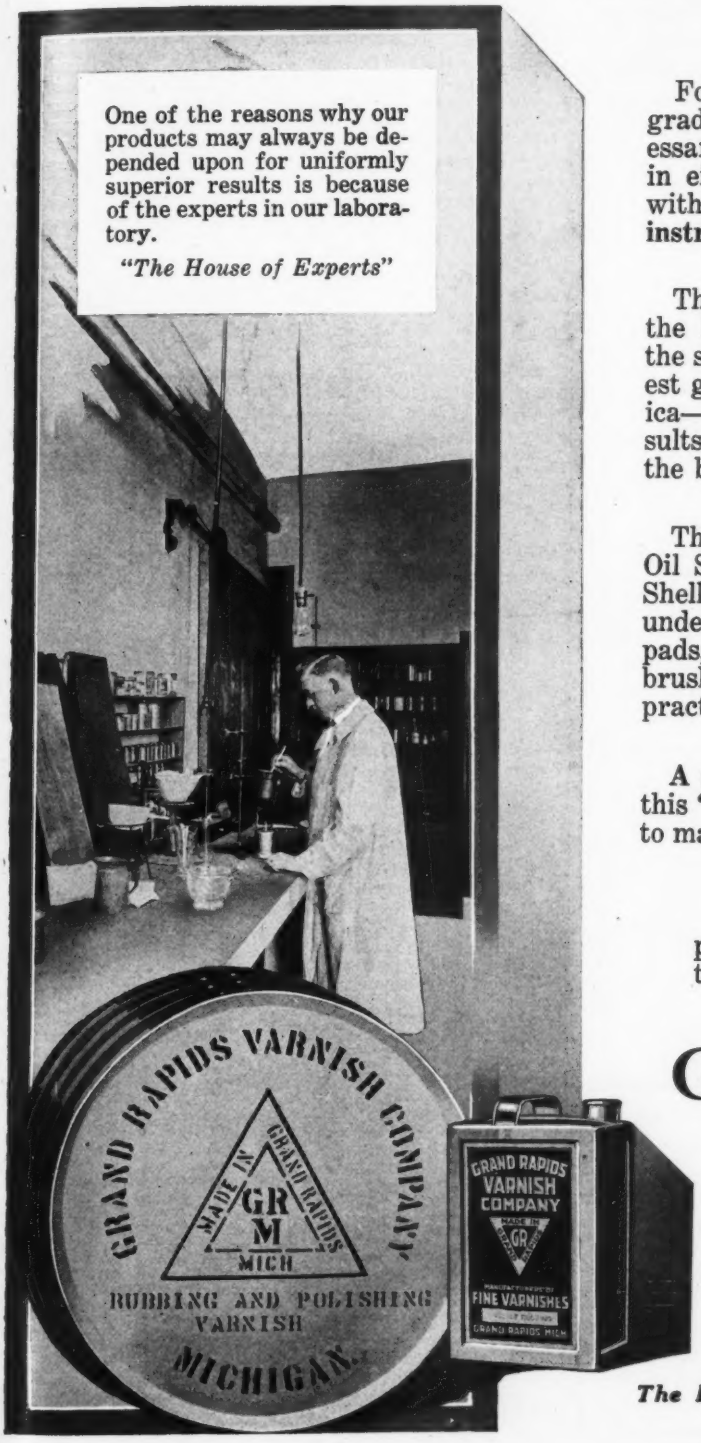
**Fathers' Night at Technical School.** More than 150 fathers of boys in the technical department of the San Diego (Calif.) high school were guests at a banquet given by the school on February 3rd. The fathers and sons and invited guests assembled in the school cafeteria where the banquet was served. Following the banquet, they were entertained with a program of music and speaking. Later the fathers were escorted by their sons through the various rooms of the technical department where they were shown many displays of work accomplished by the boys. The fathers were greatly surprised with the extensive equipment and the general excellence of the work turned out. The success of the first "fathers' night" has encouraged the school to plan other events of a similar nature later in the year.

**Farm Teaching Successful.** Vocational agriculture in the high schools of southern Illinois has assisted in the solution of farm problems, according to Carl Colvin, state supervisor of agricultural education. During 1922, agriculture was taught in 121 high schools in the state. The students are taught soil fertilization, seed testing and germination, stock breeding and feeding. As a result of dairy instruction in one high school, eight dairy herds have been started in the district.

**Vocational Courses.** The vocational school at Paterson, N. J., is offering courses in silk manufacture and de-

(Continued on Page XXVI)

# A PRACTICAL
# Wood Finishing Equipment
## For Manual Training Schools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**IAM 4-23**

(Continued from Page XXIV)

sign, machine shop work, wood pattern making, drafting and electrical work. Each of the courses covers two years. Boys must be 14 years old and must have the recommendation of the principal of the school in order to be admitted to the vocational school. Upon completion of the particular course, the boy is placed in the industry for which he was trained. The fact that more calls are received for graduates than can be filled is considered sufficient proof of the success of the work.

**Automobile Course.** An automobile laboratory course was introduced in the Washington High School, Sioux Falls, S. D., in January. The course covers both the theoretical and practical sides of the subject and is conducted under the direction of a graduate of Armour Institute of Technology of Chicago. The school has acquired considerable automotive equipment and tools for performing the very best work. The local owners of automobiles are enabled to obtain minor repairs at the school through the loan of their machines to students for practical work.

**Vocational Lectures.** Teachers College, at Columbia University, New York City, has announced a series of vocational lectures for teachers to be offered at the School of Education during the spring session of 1922-1923. Prof. Arthur F. Payne, formerly at the University of Minnesota, will be in charge of the lecture on vocational guidance given during the spring session. Prof. Payne conducted a similar lecture for teachers early in February.

**New Printing Equipment.** Two monotype keyboards have been installed free of charge in the Cincinnati Printing School by the Lanston Monotype Machine Co., of Philadelphia. Mr. John F. Locke, of the faculty of the school, recently spent several weeks in the U. T. A. School of Printing at Indianapolis, to obtain the theoretical knowledge required to instruct students in the use of the keyboards. A Babcock Optimus Press has been donated to the school as a further inducement for up-to-date instruction in this subject. With its present extensive equipment, The Cincinnati school takes the front rank of institutions of its kind in the country.

**Salaries of Agricultural Teachers.** An analysis of the salary schedules in 132 high schools of Illinois where vocational agriculture teachers are employed was made in order to test the validity of the apparent discrepancies in salary fixing. The following table contains data from all the high schools having agriculture departments organized under the plans of the state board of vocational education. Certain conditions should be kept in mind in studying the data and in making comparisons.

Agriculture teachers are employed for twelve months and are not permitted to be away from their work for more than one month including all holidays used as vacation. Much work must be done on Saturdays when other teachers are usually free to use their time as they choose. With these facts in mind, it seems fair that the comparison should be made on the basis of the monthly salary instead of the yearly salary.

The average expense incident to the work of seven teachers who reported expense last year was $351 per teacher. The amount should be subtracted from the salaries paid before the net salaries can be compared with the salaries of other teachers. The analysis shows that 2,098 teachers receive the average yearly salary, 176 the average monthly salary, and 2,021 the median salary. The gross salary of vocational agriculture teachers varies from $1,800 to $3,500 for twelve months' work. It is evident that scholarship and experience have as little to do with the fixing of salaries as they have in the general high school subjects.

Careful observation of the work done in high school indicates that boards of education are alert to the situation and are willing to increase salaries in proportion to successful results obtained.

**Printing Course.** A course in printing has been added to the vocational courses offered in the Woodlawn High School, Birmingham, Ala. The course includes instruction and practice in the use of the fundamental equipment of a printing shop. The present equipment consists of a small press, a large press, together with necessary type and cutters.

The class devotes three hours each day to the work, the remainder of the time being taken up in the other

(Continued on Page XXVIII)

Train your child
to supply the public's next great want

THERE is nothing of greater practical value to your child than good taste. And once gained it is a source of happiness he will never lose.

The clothes he wears, the home he builds and every object of use which he gathers about him will go far toward determining men's judgment of him.

In his business it can be made an active selling force. It will give beauty and effectiveness to his retail windows and counters, and its skillful touch will lend power to the letters he writes.

This important quality, good taste, is only partly instinctive in your child. Its development and guidance have become one of the most vital problems facing the men and women in the schools today. And they are solving it through school art.

*How your child is attaining it*

The boy and girl in school today are not merely drawing landscapes, as you did years ago. From the time they enter school they must construct and criticize and reject. They must design posters, book covers, advertisements, wearing apparel and interiors.

They learn color, form and arrangement. Gradually, through constant comparison of their work with known standards, there grows in them an unerring sense of values, a knowledge of color and design. And as this perception increases, a new confidence is developed, and a new power to apply this knowledge.

*If you are engaged in merchandising,* discuss with your boy tonight a problem from your own business—the arrangement of a display window or the preparation of an advertisement.

*If you are interested in manufacturing,* discuss with him designs as applied to finished products. His answers may seem strange to you, yet behind it all you will begin to see that this great quality, good taste, is being developed. You will begin to see that now as never before school art bears vitally upon the business of the future.

And most important of all, school art is building in your child that force which is perhaps the greatest of human assets—creative imagination. "Imagination," Napoleon said, "rules the world."

Through observation, perception and careful deliberation he is absorbing impressions which he must quickly turn into expression. And in the future it is this ability to create, to express with good taste, which will make your child a leader in business and social life.

*Give your active support*

Though school art has made tremendous advance in the last ten years it is still struggling under the weight of public indifference. Without the active interest of every parent in your town this work cannot grow as it should.

For the good of your child and every other child in your community, you should examine your school art situation. And if there is no art work at all in the schools, you should urge the adoption of such courses and do all in your power to further their advancement.

THE AMERICAN CRAYON COMPANY - *Established 1835 - Sandusky, Ohio, and New York*

*The world's largest makers of chalks, crayons and water colors*



# Showing parents how school art meets a public need

Above is shown in rough form the second of the new series of the American Crayon Company announcements in the Saturday Evening Post. It is designed to accomplish several important things.

First, to point out that America, in becoming prosperous, has outgrown its need for merely useful things, and that a great new desire has grown up—the desire to see beauty applied to objects of daily use.

Second, to show that the boys and girls who will some day be a part of American industry, must be able to meet this new demand if they are to be successful.

Third, to show how the schools, through their classes in design, are preparing the boy and girl to supply this want.

We believe this announcement will give parents a clearer conception of the practical significance of school art. They will see that through the study of color, form, proportion and arrangement children are developing a critical power which will be spontaneous and sure. They will see that through observation, perception and deliberation, creative imagination is fostered, which, coupled with good taste, will be invaluable.

When parents understand more perfectly what school art is actually accomplishing, their indifference will change to active support, and this subject will thus be freed of a serious handicap.

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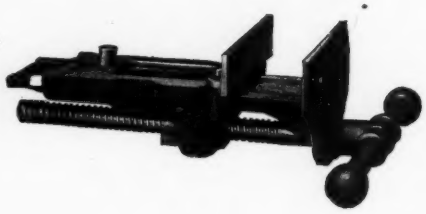
# COLUMBIAN
## Sledge-Tested VISES



Here is the most widely used and generally useful manual training school vise built — the Columbian Type 1-C. Yet it is only one of the many different models which will be of interest to supervisors of vocational training schools. The new Columbian catalog shows the complete line of vises and anvils. Your copy is ready.

**The Columbian Hardware Company**

***World's largest makers of vises and anvils***

**CLEVELAND**


(Continued from Page XXVI)

allied subjects. At other times, the work is given to those in the other high school courses who desire to take the work in printing. Practical work such as the printing of the school paper and the printing of the various school blanks, record forms, etc., is done by the regular students of printing.

**Farm Mechanics Shop.** The Watsonville (Calif.) High School District has under construction a 40'x60' farm mechanics shop. The building which is the first unit of 4 four-section shop buildings is built of concrete and hollow tile, with composition roof. The walls and roof have been erected by a firm of architects and the remainder of the work of construction will be completed by the boys of the high school shop.

**Shop Improvements.** The manual training department at New Ulm, Minn., has been strengthened with the installation of more than a thousand dollars' worth of new equipment.

**The school authorities** of Paterson, N. J. and the manufacturers and labor leaders have reached an understanding as to trade school classes. Such trades as bricklaying, plumbing, carpentry, metal working are to be taught.

**Fifty vocational teachers** recently held a conference at Racine, Wis. E. E. Gunn, Jr., state supervisor of vocational education said the following in discussing types of students and lines of study:

"The three types of students to be found taking work in continuation schools are those requiring principally academic instruction of a specific or elective nature; shop work on a useful and productive basis; or related knowledge along the lines of mathematics, drawing and science. These, then, should be the three major lines of development of the part time school program. Other courses which should be included and which will be developed, but possibly not to the extent of more than one or two year courses, will be economics, citizenship, safety, sanitation and hygiene, industrial geography, retail selling, and other special commercial lines."

**At a conference** recently held at Alliance, Ohio, the cooperation of manufacturers in promoting vocational education was agreed upon. Plant managers together with vocational instructors will make an effort to secure proper financial encouragement in fostering industrial training and work out a part time school and shop plan.

**At Oklahoma City, Okla.,** W. S. Rosemand, director of vocational education, reports that 1,324 men, women, girls and boys are enrolled in the various vocational classes. Many of these classes are conducted as evening schools.

**A committee** to make a county survey of vocational training has been appointed at Newark, N. J. R. Arthur Heller, president of the county vocational board, is chairman. Other members are Judge Stickel, member of the county vocational school board of estimate; Mayor Breidenbach, and J. Henry Bacheller, representing the city and the Board of Education, and Freeholder Dodd and County Supervisor Bowden, for the county.

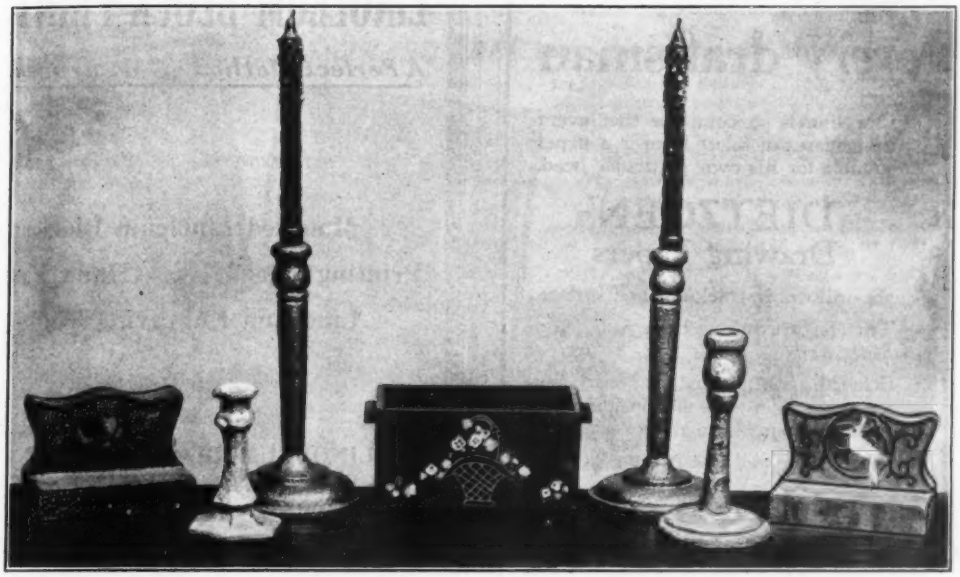
**Dr. Thomas F. Baker,** has been chosen president of the Carnegie Institute of Technology, Pittsburgh, Pa.

**The Missouri state board of education** has appointed George W. Reavis as director of vocational education and industrial rehabilitation at a salary of $3,500. The power to sign vouchers and pay department salaries has been transferred from the state superintendent to Director Reavis.

—On recommendation of Zenos E. Scott, superintendent of schools, the Louisville, Ky., school board has adopted a report made by the technical school committee consisting of ten manufacturers. This report provides for a two-year technical course to begin September 1, 1923, whereby vocational students will spend one-half time at school and the other half in the factories on wages.

**A View on Vocational Guidance.** "I do not want you to think that people are predestined at birth to a particular vocation. But it is nevertheless true that each person is born into the world with certain faculties which enable him to succeed along some lines rather than others,

(Concluded on Page XXXI)



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JESSO is the revival of an ancient European art, and is now being widely used to secure colored relief decorations. It is supplied in 2-oz. jars, ready to use, in the following colors: Rose, Scarlet, Tangerine, Melon, Mineral Green, Robin's Egg Blue, Cadet Blue, Cream, Slate, and Black.

JESSO INSTRUCTIONS: We publish a 32-page book containing many illustrations of Jesso work and directions for securing numerous beautiful and unusual effects. It will be found very useful for art instructors and students.

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merely for the asking. Simply write that you would appreciate receiving "Set No. 16-D" and it will be sent at once.

**The Stanley Rule & Level Plant**

**The Stanley Works, New Britain, Conn.**

New York Chicago San Francisco Los Angeles Seattle

***Manufacturers of Wrought Hardware and Carpenter Tools.***

(Concluded from Page XXVIII)

thus, Grant was a failure as a storekeeper, but the best general of his day," said Dr. Frank P. Graves, state commissioner of education, New York, recently in a public address. "It is necessary, therefore, that you choose wisely when determining upon your means of livelihood. Life is not an Alger book, in which perseverance and industry are the only requisites for success in any field. Here is where fathers make terrible mistakes. Each wants his son to be a 'white collar man,' regardless of the boy's natural bent. This all too frequently leads to disastrous consequences."

—**The Secretary** of the department of labor, Mr. Davis recently stated that "Our pursuit of the theoretical in education to the exclusion of the practical has led to a belief that work with the hands is menial, something disgraceful and something to be avoided." He holds that the "white collar" occupations are overcrowded while the country lacks skilled craftsmen and artisans to maintain production on the farm, in the mill and the factory. The dignity of labor must be maintained by teaching the trades in the schools.

—**The children** of the Wilkes-Barre, Pa., schools made artificial flowers and sold them for the benefit of disabled soldiers which effort was favorably received by press and public. The work was under the direction of Miss Wentzel, the supervisor of arts.

**Professional Drawing Course.** A professional improvement course in drawing and handwork for grade teachers and for special teachers and supervisors of art and industrial art will be offered at the summer session of the State Normal School, Potsdam, New York, to be held beginning July 2nd and ending August 11th. The course aims to acquaint the student with a working program of instruction and to assist teachers in carrying out in their schools the work suggested in the new bulletin on art and industrial art issued by the New York Department of Education. The course will be in charge of Mr. Leon L. Winslow, specialist in drawing and industrial training in the New York State Department of Education. It has been arranged that time given to classwork shall be devoted to theory and to clarifying practice in the use of media appropriate to the elementary grades.

**Industrial Arts Courses.** Industrial art courses have been introduced for the first time in the high school at Roanoke Rapids, N. C. At present only one room is available for classes in bench woodwork and mechanical drawing. It is planned to enlarge the department as available space develops. Courses in machine wood working, cement work, sheet metal work, etc., will be added as the demand arises.

The course in mechanical drawing in the seventh and eighth grades is correlated closely with the woodwork. In the ninth, tenth, eleventh and twelfth grades it is planned to place the work on as nearly as possible a draftman's basis or for preparatory work for college entrance. In the near future it is planned to house this type of work in a separate building. The industrial arts work is in charge of Mr. R. G. Knight, director of the department.

**Art Department.** Under the direction of Miss Gladys Harvey, a new art department has been inaugurated at Stout Institute, Menomonie, Wis. It is planned to substitute practical problems for the more theoretical work so that classes may learn by experience and at the same time beautify the rooms of the school building. The classes will undertake the decoration of the dining room.

**Mrs. Lucille Schauvin,** formerly Miss Carmody of the Detroit high school faculty, is supervising a course in home economics in the high school at Mechanicville, N. Y.

**Messrs. L. E. Campbell, W. B. Clement, C. O. Monair, E. M. Tackett, Alfred Bomer** and **A. C. Andrews** are the new manual training teachers at Dallas, Tex.

**Establish Vocational Work.** The central labor council of Texas has endorsed the bill to establish vocational training schools in that state.

**Vocational School.** The citizens of Newark, N. J., are discussing a $500,000 bond issue for the establishment of a vocational school. The school board supports the project.

**Globe, Ariz.** The assaying class in the high school last winter ran over a thousand assays for copper, silver and gold for the several mines and prospectors in the vicinity of the high school.

YOU CAN TRUST A STARRETT CALIPER

STARRETT Calipers wear well because they are made **right.** Almost any caliper is right when you buy it—the real test comes after it has been used regularly for several years. Starrett Calipers are deservedly popular with machinists.

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## A FINISH TROUBLE.

To the Editor:

The accompanying photograph is that of the top of a table made in the shop here last year. Perhaps you may think it to be interesting to other manual training teachers

You will notice indentations in the top and that they occur in three rows. They were caused, I think, in this way. In order to do our joining work and make the job permanent we have soaked the edges of the boards to be joined in as hot a water as we could get. The dowel holes were filled and the water let stand in them for a half minute or so and emptied out before gluing up. This particular table top was of inch and a quarter stock and the boy did the work without my being able to supervise

so far as the actual gluing work was concerned. He glued the four boards at once and washed off the excess glue with much hot water. This of course he should not have done. The glue he used was in the proper condition, thin, and quite hot. Well, he had reasons for making haste with the job and so the next day he planed off the top.

The hot water and the hot glue caused the wood to swell and the planing the next day removed the wood that was puffed up around the dowel holes and during the time the top was being fitted and properly prepared for finish the wood shrunk and left the depressions which appear in the photograph. Everything contributed to the result shown. The wood was of that variety of white oak that is soft, light and porous, the dowel holes were probably left with water in them a little longer than usual, and then the water used on the outside of the boards contrary to instructions contributed a little.

—M. B. Merriman, Fort Collins, Colo.

## NEW BOOKS.

**Toy Craft.**

Leon H. Baxter. Cloth, octavo, 132 pages. Price $1.30. The Bruce Publishing Company, Milwaukee, Wis.

Toy making has always interested boys in manual training shops when other projects failed to hold them. The present book is the outgrowth of the author's long experience in teaching and provides a carefully graded series of toys beginning with simple coping saw toys to doll furniture, games and various action toys of interest to children between the ages of 8 and 12. The book is carefully illustrated with working drawings and photographs and complete directions are provided. Teachers will appreciate the latter feature which makes the book practically self-teaching.

**Machine Shop Mathematics.**

By George Wentworth, David Eugene Smith and Herbert Druery Harper. Cloth, 162 pages, illustrated. Ginn & Co., Boston, New York, Chicago.

The authors of this book have developed this book from a perfectly natural basis. They have taken the common operations of the machine shop as applied on the generally used machines and have observed the mathematical problems involved. They have stated the operations, defined terms and explained common practices. With the aid of the universally used formulae they have built on this broad basis a series of exercises and problems. The student thus gets no theoretical or useless material, but a wide range of practical, every day shop mathematics. The book is excellent in every way.

**Automotive Manual.**

By Albert Leroy Taylor and A. Harold Blake. Cloth, 178 pages. The Macmillan Co., New York, N. Y.

(Continued on Page XXXV)

*A general view of the Printing Department of the Seymour Vocational School, Newark, N. J.*

**The Kelly Automatic Press,** a machine that produces the finest kind of printing at a speed of 3,500 impressions per hour.

# Printing + Interest = Education

THE PRINT SHOP OF THE SEYMOUR VOCATIONAL SCHOOL, NEWARK, N. J., is not shown for the sole purpose of showing you the equipment, although you are probably interested in such equipment, but there is a greater significance in the picture. Note the interest of these future printers in their work. So great that not a boy even looked at the camera. They are printing their school paper, a beautiful twenty-four page booklet.

Boys, the sizes and ages shown, are not interested in a subject that doesn't appeal to them. Printing fascinates most boys. It teaches them the use of punctuation marks, the making of proper margins, the use of good English, correct spelling, capitalization, and indention in an accurate manner.

School Printing Outfits are inexpensive. They are designed for manual training, pre-vocational, vocational, trade, journalistic laboratory, and the four-activities-in-one-room types of instruction. The smallest school communities and all other types of schools to the the largest universities are installing printing.

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Sail Montreal—June 30. Fine one class steamer—Canada.
Arrive Liverpool—July 8

Sail Antwerp, Belgium—Aug. 15. Steamer—St. Paul.
Arrive New York—Aug. 25

Trip includes four days in busy London; motoring through Shakespeare country; historic Warwick and Kenilworth Castles; Oxford University; Holland with its windmills, dykes and canals; excursion by steamer to Isle of Marken in the Zuider Zee; Cologne and the "Castled Rhine" by steamer; Heidelberg, Lucerne and the William Tell and Schiller country; Interlaken—the Jungfrau. Coach ride through Lauterbrunnen Valley and Trimmelbach Falls; ascent of Burgenstock; the Italian lakes; two weeks in Italy:—Gondola rides on Grand Canal, Venice; Milan; Florence with its great art galleries; four days in Rome; auto trip to the Catacombs, Appian Way, Colosseum, etc.; Naples, auto trip to Pompeii; Mt. Vesuvius; steamer on Mediterranean Sea to Island of Capri and Blue Grotto; Genoa—birthplace of Columbus; world famous Casino of Monte Carlo; Nice and French Rivierra; four days in beautiful Paris; magnificent Versailles; American Battlefield Sector—Chateau Thierry, Belleau Wood and the Argonne; Brussels and quaint Antwerp—returning by Steamer St. Paul to New York.

The $790 includes all steamship accommodations ($130 berth), hotels, meals, auto and steamer rides in Europe; guides, tips and handling of baggage and services of competent Conductor. Opportunity given for shopping, amusements and recreation as desired.

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Freehand Drawing
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Machine I, II
Mechanical I, II
Mechanical Perspective
Printing Design
Projection
Sheet Metal
Cabinet Making, Elementary
Cabinet Making, Advanced
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Electrical Machinery
Electric Wiring
Furniture Upholstery I, II, III
Forging I, II
Installation and Care of Machinery
Linotype Operating
Linotype Mechanics
Mill Work
Machine Shop I, II
Observation of Teaching
Pattern Making I, II
Printing I, II, III
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It also will give such light on methods, ways and means as will be of real help in fitting a supervisor to satisfactorily discharge his duties.

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# Summer School Directory


## STOUT INSTITUTE

***Summer Session Nine Weeks, June 25-August 24, 1923***
***Regular Session September 10, 1923-May 30, 1924***

The following courses are offered in the Summer Session

### VOCATIONAL EDUCATION—7 courses

For directors and teachers of State and Federal aided Vocational and Industrial Work.

Administrative Problems
Organization of Home Economics
Organization of Industrial Arts
Principles of Education
Principles of Teaching
Teaching Vocational and Industrial Classes
Vocational Education

### INDUSTRIAL ARTS—40 courses

For teachers and supervisors of Industrial Arts and Manual Training in Elementary and Secondary schools, junior and senior high schools and for Vocational School teachers.

Auto Mechanics I, II, III.
Bricklaying and Concrete I, II.
Cabinet Making I, II.
Carpentry I.
Drawing—
Architectural I, II.
Elements of Mechanical Drawing
Machine Drawing I, II, III.
Electrical I, II.
Elements of Woodwork I, II.
Forging I, II, III.
Foundry I.
Furniture Upholstery.
Home Mechanics I.
Machine Shop I, II, III.
Millwork I.
Patternmakking I, II.
Printing I, II, III, IV.
Radio I.
Sheet Metal I, II, III.
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For teachers and supervisors of Household Arts, for dietitians and for institutional directors.

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Community Hygiene.
Cookery I, II, III, IV, V.
Costume Design.
Food Study.
House Management.
Household Physics.
Hygiene and Home Nursing.
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*Teachers of Manual and Industrial Arts*
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*Exceptional Shop and Studio Facilities.*

**For catalogue, address the Director of the Summer Session, Carnegie Institute of Technology, Schenley Park, Pittsburgh, Pa.**


(Continued from Page XXXII)

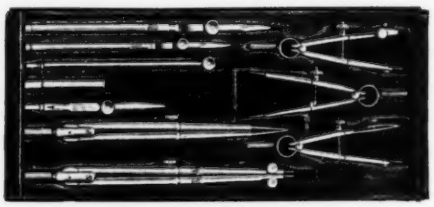
The automotive trades are becoming an increasingly essential and popular part of trade and continuation school courses. The present book is an exceedingly brief, introductory text. It is arranged on thoroughly correct pedagogical lines and utilizes the shop project method to the full limit. The illustrations are large, and the questions at the end of the chapters are useful for leading to shop study and practical work.

### PUBLICATIONS.

**Measuring the Student's Progress in Shopwork.** By William T. Bawden. Industrial Education Circular No. 14, October, 1922, U. S. Bureau of Education, Washington, D. C. This pamphlet constitutes the report of the conference of supervisors of instruction in shopwork and drafting in the public schools, called by the Commissioner of Education and held at Rochester, N. Y., in April, 1922. The report reproduces three papers bearing on the subject of the conference. These are: Objectives in Educational Shopwork, by R. H. Rodgers, Albany, N. Y.; Methods of Recording the Completion of Successive Portions of the Work, by Wm. E. Roberts, Cleveland, O.; Objective Tests of Performance or Attainment, by Verne A. Bird, Utica, N. Y. There is a very useful list of selected references on objective tests in the manual arts and industrial subjects.

**The New Chance for Disabled Men and Women.** An illustrated description of the service rendered by the Nebraska state board of vocational education in training disabled men and women to reenter industry and to become self-sustaining members of society. The booklet shows conclusively that the work is not charity.

—**The position** of assistant director of continuation schools created by the New York City board of education will command a salary of $4,250. Miss Isabel A. Ennis receives the position.



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**How to Attract Birds in the Middle Atlantic States, W. L. McAtee.** Farmers' Bulletin 844, September, 1917. U. S. Department of Agriculture, Washington, D. C. This bulletin is one of a series intended to describe the best methods of attracting birds in various parts of the United States. It discusses protection of birds, breeding places, water supply, food supply and seasons of fruits attractive to birds.

**Self-Supporting Home-Economics Departments.** By Mrs. Henrietta W. Calvin. Home Economics Circular No. 15, October, 1922. Price, five cents. Issued by the U. S. Bureau of Education, Washington, D. C. The school lunch room may be but a feeding station, or it may be made an educational factor of the highest value. It should be the latter, not alone for the relatively few girls who participate in the preparation of the food but for every individual connected with the school. The pamphlet discusses lunchroom management, lunch preparation in small schools, prices of foods, and courses of study in food preparation.

**Analyzing a Poultry Enterprise.** Suggestions for teachers. Bulletin No. 75, June, 1922, issued by the Federal Board of Vocational Education, Washington, D. C. This bulletin, which is a revision of Bulletin 63, "A Unit Course in Poultry Husbandry," has been prepared to emphasize the farm job basis of teaching. The subject-matter is directed toward the vocational teachers in all-day and part-time schools and teacher-trainers, with the hope that it may be of service to them in the determination of the technical and related subjects of instruction. The material was prepared by Mr. C. H. Schropmeyer and was issued under the direction of the agricultural department of the Federal Board.

**Engineering Education After the War.** Arthur M. Greene, Jr. Bulletin No. 50, 1921, issued by the U. S. Bureau of Education, Washington, D. C. The period covered by this paper followed the demobilization of that experiment in education under war conditions known as the Students' Army Training Corps. The bulletin offers a schedule of studies for the four engineering courses as proposed by the Committee on Education and Special Training, outlines the studies submitted by the Rensselaer Polytechnic Institute, and traces the later developments in engineering education.

**Chicago Public High School Course in Retail Selling and Advertising.** The U. S. Bureau of Education, Washington, D. C. This pamphlet outlines the purpose and subject-matter of an evening vocational course in retail selling and advertising. It was prepared under the direction of Mr. William Bachrach by four experienced instructors.

**Agriculture in the High School.** Prepared by Harry O. Simpson, state supervisor of agriculture. Issued by the New Jersey Department of Education, at Trenton. The pamphlet forms in part a record of the progress made in agricultural instruction in the high schools since the passage of the federal act for vocational education. It describes various phases of the work and indicates some of the concrete results that have been achieved by pupils in the agricultural classes. The beneficial effects of the work have already made themselves felt in numerous ways, some of which are discussed in the report. The course has not been limited to agriculture alone, but includes other high school subjects such as English, mathematics, science and history. It is pointed out that the boy who graduates has a good high school training in addition to a knowledge of agriculture that fits him for successful farming.

**Vocational Rehabilitation: Its Purpose, Scope and Methods with Illustrative Cases.** By John A. Kratz. Bulletin No. 80, Vocational Series No. 7, January 23, 1923, Federal Board for Vocational Education, Washington, D. C. This bulletin was prepared under the direction of John A. Kratz, with the cooperation of members of the rehabilitation staff. The material was gathered in response to a request for general publicity matter relating to the work of rehabilitation. Besides many case histories illustrating various aspects of the work, the bulletin is illustrated with numerous photographs of actual cases. The bulletin should serve as a means of promoting the work in those states which have not cooperated with the Federal Government, and should prove an incentive for further expansion on the part of the states where the work has already been introduced.

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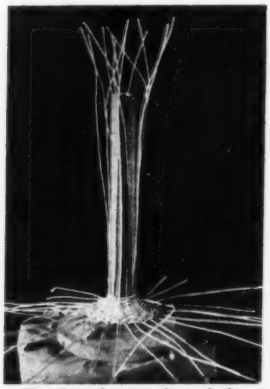

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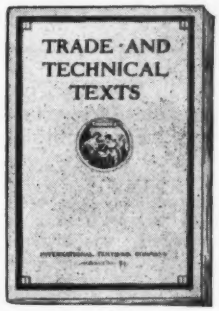


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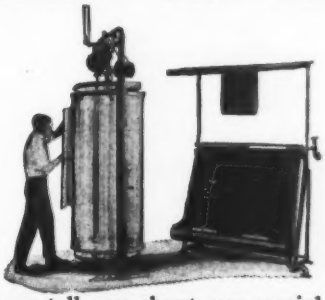

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## PERSONAL NEWS.

**Mr. H. C. Singer** of Ames, Ia., has accepted a position as supervisor of manual training at Atlantic.

**Mr. Edward T. Welsh**, formerly coordinator for the vocational schools of Buffalo, N. Y., has been appointed director of the labor certificating bureau of the Buffalo Public Schools. Mr. Welsh will continue his work as coordinator.

**Mr. Paul Wamsley**, formerly instructor in science at the Seneca Vocational School, Buffalo, N. Y., has been appointed assistant principal at School No. 5.

**Mr. Earl J. Simpson**, of the Oklahoma University Engineering School, is teaching mechanical drawing in the Oklahoma City Schools.

**Mr. R. E. Reynolds**, of the Oklahoma University Engineering School, is teaching shop work in the Oklahoma City Schools.

**Mr. Joe Morrow**, also of the Oklahoma University Engineering School, teaches shop work, and **Mr. J. D. Turner** teaches shop work and mechanical drawing.

**Mr. D. Hurst**, formerly superintendent of schools at Altus, Okla., teaches shop work in the Oklahoma City Schools.

**Mr. F. E. Allen**, of the Oregon Agricultural College, is in charge of the general industrial school at Pendleton, Ore. Mr. Allen has been directing considerable practical work, putting in concrete walks in town, pouring concrete, and making concrete fence posts. The course has proven popular with the boys and the classes are filled to capacity.

**Mr. Percy Dawe**, of the Oregon Agricultural College, has been appointed head of the manual training department at Estacada, Ore.

**Mr. L. W. Mack** has accepted a position in the schools of Portland, Ore.

**Mr. Paul Beaufort** of the Oregon Agricultural College, has become head of the manual training department at Ukiah, California.

**Mr. T. A. Ellestead**, of the Oregon Agricultural College, has been given an increase of $400, as head of the manual training department at Coalinga, Calif.

**Mr. James D. MacLean** of Campbellton, N. B., Canada, has been appointed instructor in manual training at St. John, N. B.

**Miss Nellie Reinhold** has been elected as household arts supervisor of the Erie, Pa., public schools. Miss Reinhold has been a successful teacher in the Erie schools for the past nine years. During the past two years she has had charge of organizing five cafeterias in the schools which have been successful in every particular.

**Mr. C. L. Bailey**, instructor in metal work at the first district school, Cincinnati, O., has accepted a position as educational director for the Building Trades Association of Chicago, at a salary of $5,000.

**Howard R. Porter**, for three years director of manual training in the elementary schools, Ellensburg, Wash., has resigned to become principal of the Training School of the Washington State Normal School, located in the same city. His place as manual training director has been filled by J. Bernard Swanson, a graduate of Washington State College.

## PUBLICATIONS.

**State Certification of Home Economics Teachers.** Home Economics Circular No. 12, March, 1922. Price, five cents. U. S. Bureau of Education, Washington, D. C. The statements contained in the pamphlet are either direct quotations from the state laws or have been prepared or approved as correct by the state superintendent of public instruction in the particular state referred to. The pamphlet contains the rules pertaining to the granting of certificates in the states of Arizona, Arkansas, California, Colorado, Connecticut, Delaware, Florida, Georgia, Idaho, Illinois, Indiana, Iowa, Kansas, Kentucky, Louisiana, Maine, Maryland, Massachusetts, Michigan, Minnesota, Mississippi, Missouri, Montana, Nebraska, Nevada, New Hampshire, New Jersey, New Mexico, New York, North Carolina, North Dakota, Oklahoma, Oregon, Pennsylvania, Rhode Island, South Carolina, South Dakota, Tennessee, Texas, Utah, Vermont, Virginia, Washington, West Virginia, Wisconsin and Wyoming.

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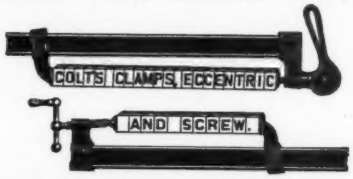


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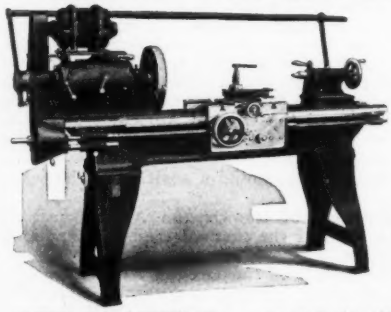

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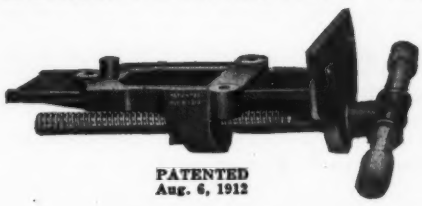

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U. S. Blueprint Company

### DRAWING MATERIALS
Devoe & Raynolds Co.

### DRAWING TABLES
Bemis, A. L.
Bradley Co., Milton
Christiansen, C.
Dietzgen Co., Eugene
Pease Company, The C. F.
Weber Co., F.

### DRILLS AND DRILL PRESSES
Goodell-Pratt Company
Greenfield Tap & Die Corp.
Jennings Mfg. Co., Russell
Millers Falls Company

### ENAMELS
Marietta Paint & Color Co.
Prang Company, The

### EXHAUST FANS
Oliver Machinery Co.

### FIBRE CORD
Grand Rapids Fibre Cord Co.

### FILLERS
Johnson & Son, S. C.
Marietta Paint & Color Co.

### FLASKS
Oliver Machinery Co.

### FORGES
Oliver Machinery Co.

### FURNACES FOR SOLDERING, HEAT-TREATING, METAL MELTING
Johnson Gas Appliance Company

### FURNITURE FRAMES
Grand Rapids Fibre Cord Co.

### GAUGES
Atkins & Company, Inc., E. C.
Disston & Sons, Inc., Henry
Goodell-Pratt Company
Stanley Works
Starrett Company, L. S.
Williams & Co., J. H.

### GLUE HEATERS
Hall & Brown Woodworking Mach. Co.
Oliver Machinery Co.
Wallace & Co., J. D.

### GOLD
Herpers Bros.

### GRINDERS
Cleveland Stone Co.
Crescent Machine Company, The
Efficiency Grinder Company
Greenfield Tap & Die Corp.
Mummert-Dixon Co.
Oliver Machinery Co.

### HACKSAWS AND BLADES
Atkins & Company, E. C.
Clemson Brothers, Inc.
Disston & Sons, Inc., Henry
Goodell-Pratt Company
Millers Falls Company
Simonds Saw & Steel Co.
Starrett Company, L. S.

### HAMMERS
Atkins & Company, Inc., E. C.
Maydole Hammer Co., David
Stanley Works
Vaughan & Bushnell Mfg. Co.

### HAND SCREWS
Christiansen, C.

### INKS—DRAFTING
Dietzgen Co., Eugene
Pease Company, C. F.
U. S. Blue Print Company
Weber Company, F.

### INKS—PRINTING
American Type Founders Co.
Barnhardt Bros. & Spindler

### JOINTERS
Crescent Machine Company, The
Gallmeyer & Livingston Company
Hall & Brown Woodworking Mach. Co.
Oliver Machinery Co.
Wallace & Co., J. D.

### LAPIDARIES
Espositer, Varni Co.

### LATHE DOGS
Williams & Co., J. H.

### LATHES—METAL WORKING
Goodell-Pratt Company
Little Giant Company
Monarch Machine Tool Company
Oliver Machinery Company
South Bend Lathe Works
Steptoe Co., The John

### LATHES—WOODWORKING
American Saw Mill Machinery Co.
Goodell-Pratt Company
Greenfield Tap & Die Corporation
Hall & Brown Woodworking Mach. Co.
Little Giant Company
Wallace & Company, J. D.

### LEVELS
Disston & Sons, Henry
Goodell-Pratt Company
Millers Falls Company
Stanley Works
Starrett Co., L. S.

### LUMBER
Englewood Top & Panel Company
(See also Lumber Dealers' Directory)

### MACHINE KNIVES
Atkins & Company, E. C.
Crescent Machine Company, The
Disston & Sons, Inc., Henry
Hall & Brown Wdwkn. Mach. Co.
Oliver Machinery Co.
Simonds Saw & Steel Co.

### MANUAL TRAINING BENCHES
Bemis, A. L.
Christiansen, C.
Hammacher, Schlemmer & Co.
Sheldon & Co., E. H.

### MECHANICS' HAND TOOLS
Atkins & Company, Inc., E. C.
Cincinnati Tool Company, The
Disston & Sons, Inc., Henry
Goodell-Pratt Company
Gross Hdwe. & Supply Co.
Hammacher, Schlemmer & Co.
Peck, Stow & Wilcox Co.
Starrett Company, L. S.
Williams & Co., J. H.

### METALS—PRECIOUS
Herpers Bros.

### METAL WORKERS' TOOLS
Berrer Bros. Co.
Cincinnati Tool Company, The
Disston & Sons, Inc., Henry
Goodell-Pratt Company
Gross Hdwe. & Supply Co.
Hammacher, Schlemmer & Co.
Johnson Gas Appliance Company
Niavara Machine & Tool Works
Peck, Stow & Wilcox Co.
Starrett Company, L. S.

### MILLING MACHINES
Steptoe Co., John

### MITRE BOXES
Atkins & Company, Inc., E. C.
Goodell-Pratt Company
Millers Falls Company
Stanley Works
Tannewitz Works

### MODELLING CLAY
Bradley Company, Milton
Hammett Company, J. L.
Laclede-Christy Clay Prod. Co.
Weber Co., F.

### PASTE
American Crayon Company
Bradley Company, Milton
Weber Company, F.

### PENCILS
Faber, Eberhard
Dixon Crucible Co., Joseph
Weber Company, F.

### PHONOGRAPH SUPPLIES
Choraleon Phonograph Company

### PLANES
Stanley Works
Wallace & Co., J. D.

### POTTERY KILNS
Drakenfeld & Co., B. F.

### POWER HAMMERS
Little Giant Co.

### PREPARED WAX
Johnson & Son, S. C.

### PRINTING PRESSES
Miehle Ptg. Press & Mfg. Co.

### PRINTING SUPPLIES
American Type Founders
Barnhart Bros. & Spindler

### PUNCHES
Cincinnati Tool Company, The
Niagara Machine & Tool Works

### RADIO APPARATUS
Rowles Co., E. W. A.
Tribune Airfone Company

### RULES
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Goodell-Pratt Company
Pease Company, C. F.
Rowles Co., E. W. A.
Stanley Works
Starrett Co., L. S.
Weber Company, F.

### SAWS
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Crescent Machine Company, The
Disston & Sons, Henry
Gallmeyer & Livingston Co.
Hall & Brown Woodworking Mach. Co.
Huther Bros., Saw Mfg. Co.
Millers Falls Co.
Oliver Machinery Company
Starrett Co., The L. S.
Simonds Saw & Steel Co.
Tannewitz Works, The
Union Machine Co.
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### SAW BENCHES
American Saw Mill Machinery Co.
Gallmeyer & Livingston Company
Hall & Brown Woodworking Mach. Co.
Oliver Machinery Co.
Tannewitz Works, The
Wallace & Co., J. D.

### SCREW DRIVERS
Cincinnati Tool Company, The
Disston & Sons, Henry
Goodell-Pratt Company
Jennings Mfg. Co., Russell
Millers Falls Company
Starrett Co., The L. S.

### SEWING TABLES
Christiansen, C.

### SHAPERS—METAL WORKING
Steptoe Co., John

### SHEARS
Niacara Machine & Tool Works.

### SHEET METAL MACHINERY
Johnson Gas Appliance Company
Peck, Stow & Wilcox Co.

### SHEET METAL TOOLS
Berrer Bros. Co.
Johnson Gas Appliance Company
Niagara Machine & Tool Works

### SILVER
Herpers Bros.

### SQUARES
Disston & Sons, Inc., Henry
Stanley Rule & Level Co.
Starrett Co., L. S.

### STAINS
Grand Rapids Wood Finishing Co.
Johnson & Son, S. C.
Marietta Paint & Color Co.

### STONES—PRECIOUS
Espositer, Varni Co.

### THUMB NUTS
Williams & Co., J. H.

### TINSMITH'S TOOLS
Berger Bros. Co.
Niagara Machine & Tool Works

### TOOLS
Atkins & Company, Inc., E. C.
Cincinnati Tool Company, The
Disston & Sons, Inc., Henry
Goodell-Pratt Company
Hammacher, Schlemmer & Co.
Greenfield Tap & Die Corp.
Millers Falls Company
Starrett Company, L. S.
Vaughan & Bushnell Mfg. Co.
Williams & Co., J. H.

### TOOL GRINDERS
Atkins & Company, Inc., E. C.
Greenfield Tap & Die Corp.
Mummert-Dixon Co.
Oliver Machinery Co.

### TOOL HOLDERS
Williams Co., J. H.

### TYPE
American Type Founders
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### UPHOLSTERING SUPPLIES
Dodge-Dickinson Co.
Cincinnati Tool Co., The
Rauch & Co., F. A.

### VARNISHES
Grand Rapids Fibre Cord Co.
Grand Rapids Varnish Corp.
Johnson & Son, S. C.
Marietta Paint & Color Co.

### VISES
Columbian Hardware Company, The
Bemis A. L.
Goodell-Pratt Company
Millers Falls Company
Parker Co., Charles, The
Williams & Co., J. H.

### VISES—WOODWORKERS'
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Columbian Hardware Company, The
Christiansen, C.
Oliver Machinery Company
Parker Company, The Charles

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Bradley Company, Milton
Binney & Smith Co.
Weber Company, F.

### WAX CRAYONS
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Bradley Company, Milton
Binney & Smith Co.
Dixon Crucible Company, Joseph
Weber Company, F.

### WEAVING MACHINERY
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### WEAVING MATERIALS
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### WOODWORKING MACHINERY
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Amer. Woodworking Mach. Co.
Black Brothers Co., The
Crescent Machine Company, The
Gallmeyer & Livingston Company
Greenfield Tap & Die Corp.
Hall & Brown Wdwkg. Mach. Co.
Mattison Machine Works.
Oliver Machinery Co.
Smith Machine Co., H. B.
Steptoe Company, John
Tannewitz Works, The
Wallace & Co., J. D.

### WOOD FINISHES
Grand Rapids Wood Finishing Co.

### WRENCHES
Cincinnati Tool Company, The
Greenfield Tap & Die Corp.
Vaughan & Bushnell Mfg. Co.

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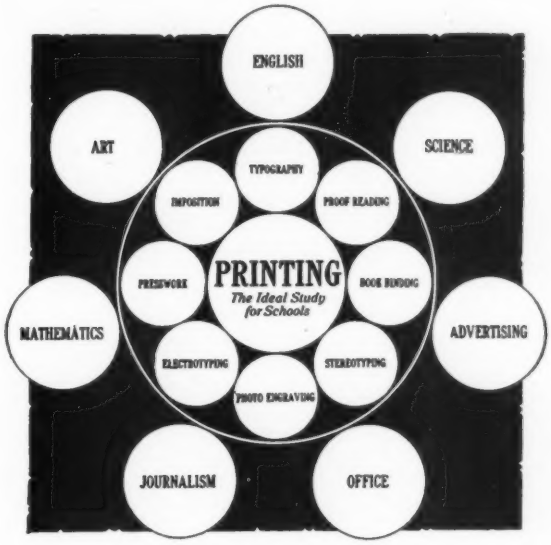


# *Relation of* PRINTING *to Other Subjects of the Curriculum*

## *English*

Sentence construction, spelling, punctuation, capitalization, division of words, paragraphing, compound words, writing essays for school paper.

## *Art*

Study of color harmony and application of color to the printed page. Design as applied to printing. Relation of type to shape of page. Study of proportion, balance, tone harmony and ornamentation, spacing, handlettering, mechanical drawing, making layouts.

## *Journalism*

Writing articles for school paper; editing copy prepared for publication (embodying in a general way the subject of English).

## *Office*

Finding cost of production and calculating correct profits; becoming acquainted with efficiency systems, keeping records, filing, general office requirements.

## *Mathematics*

As applied to type spacing, point and pica system of type measurement, estimating cost of composition of straight matter and job printing, amount of paper required for a job and the cutting of it, the measurement of type masses, relative sizes of type, total cost of production.

## *Science*

Analysis of printing inks, of type metals—lead, tin, antimony, copper (used in the alloying of type metals), mechanical motions and frictions, electrotyping, stereotyping, photoengraving, bookbinding.

## *Advertising*

Psychology of advertising; typography and English of advertising; economical implications; interpretations of principles involved; the relation of theory and practice as related to advertising; mechanical make-up; emphasizing thought; proper methods of finding proportion.

*Prepared by the* EDUCATIONAL DEPARTMENT

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*Manufacturers and Merchants of* SCHOOL PRINTING EQUIPMENT

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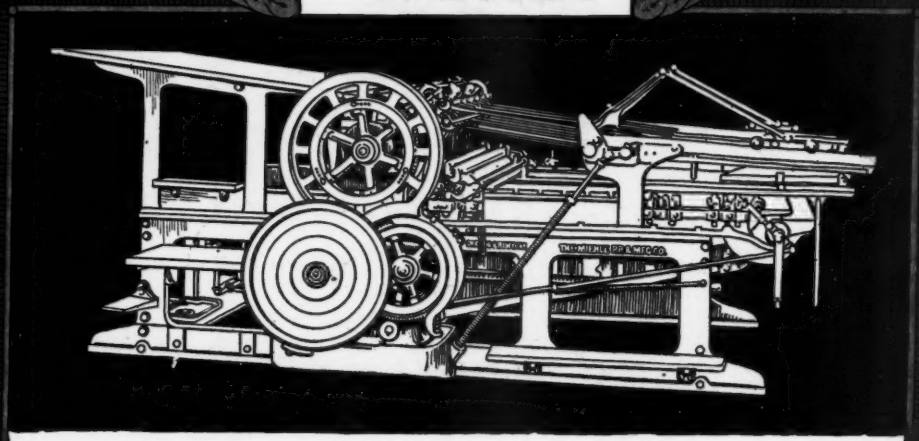

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